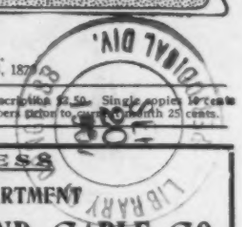
The JOURNAL OF ELECTRICITY
POWER AND GAS
WITH WHICH IS INCORPORATED
The Engineers' Architects' and Builders' News

PUBLISHED WEEKLY

By the Technical Publishing Company, Atlas Building, 604 Mission Street, San Francisco Cal.
Entered as second-class matter May 7, 1906, at the Post Office at San Francisco, Cal., under the Act of Congress March 3, 1879.

Vol. XIX. No. 11 San Francisco, Cal., September 14, 1907. Yearly subscription $2.50. Single copies 10 cents. Back numbers prior to current month 25 cents.



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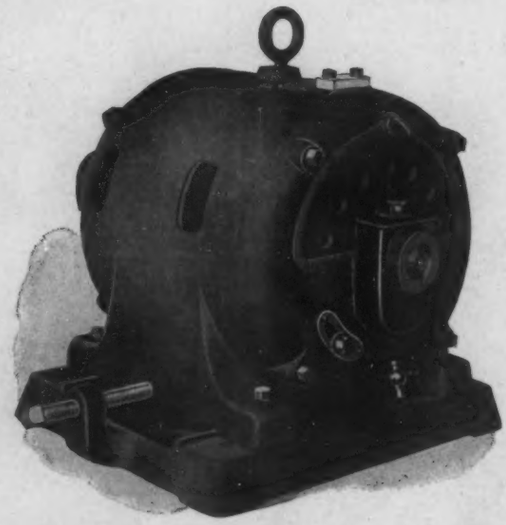

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THE

Journal of Electricity, Power and Gas

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The Engineers', Architects' and Builders' News

VOLUME XIX. SAN FRANCISCO, CAL., SEPTEMBER 14, 1907 No. 11

ELECTRIC SEARCHLIGHTS FOR LIGHTHOUSE SERVICE

The motor boat is now becoming so common that it is used extensively for cruising and must depend upon the lighthouses at night for guidance, and therefore boat owners should become familiar with the location, intervals of flashes, and other data of the lights in the vicinity of their range of operations.

HELIGOLAND LIGHTHOUSE ELECTRIC SEARCHLIGHT

Until recently oil-burning lamps were used exclusively for lighthouses, but now electric searchlights are employed and electric focusing lamps are very largely employed to take the place of the oil lamp. It is interesting to note that the same source of power is used for driving the generators for supplying the electric current as is used for propelling the motor boat, the internal combustion engine being found the most economical and reliable.

Electric searchlights have been utilized for some time past not only in lighthouses of the German government, but also those of the United States. The accompanying illustration, Fig. 1, shows German searchlights as installed at the Heligoland lighthouse, while Fig. 3 shows the twin lights of Highlands of Navesink, N. J., of the United States lighthouse department.

TWIN LIGHTS OF NAVESINK, N. J.

LIGHTHOUSE AT SOUTH WEST LEDGE STATION

Figure 2 shows the Southwest Ledge station which is equipped with two 7-horsepower engines and electrical generators. The two 25-horsepower engines are of the Hornsby-Akroyd type, using oil as a fuel, and belted to generators which furnish current for the great revolving searchlights. These engines, it is stated, have run continuously from sunset to sunrise for over seven years. In the Stratford Shoal light station there are two oil engines driving dynamos of small size, each engine having a capacity of only four horse-

power. In many lighthouses similar engines are utilized for driving air condensers, supplying the necessary air pressure for operating the fog signals, and it is obvious that every detail of the mechanical equipment of these lighthouses must be of the highest grade, where the momentary stoppage of the signals in case of fogs, or the searchlights, particularly in stormy weather, might result in shipwreck. Absolute reliability is made even more essential because these stations are so far from any repair shops and beyond the immediate reach of skilled mechanics. It is absolutely impossible for tenders to make a landing when the sea is high during or after a storm, and the apparatus, including the generators and engines, must always be in perfect working order. These engines were constructed at the plant of the De La Vergne Machine Co. and the sizes used in the lighthouses vary from four horsepower up to twenty-five horsepower.

In many of the lighthouse plants the current is used for government wireless telegraph stations, a most complete plant of this character having been installed at Navesink Highlands, N. J. Not only must the electrical and mechanical equipment be reliable, but the governing qualities of the engines must be almost perfect. The regulation in these oil engines is affected by a governor, the lever of which, working on the by-pass valve, allows a certain amount of the oil displaced by the positively driven oil-pump piston, to flow back to the reservoir. When operating under ordinary conditions of load, the governor cam opens only the small inside valve, which regulates the amount of oil injected into the vaporizer. But should the tendency of the engine be to speed up, due to a quick reduction of the load, the governor arm will open, not only the small inside valve, but also the larger concentric valve outside, in which case all of the oil will return to the reservoir and none enter the vaporizer. These lighthouse oil engines are operated on the four-stroke cycle and are said to be extremely economical, while the form of fuel used is very satisfactory for this service. The searchlights of both German and American lighthouses are now very largely operated by electricity.

The accompanying illustration, Fig. 1, shows a combination outfit of searchlights of German construction, showing a main rotary platform supporting three projectors and an upper turntable equipped with an auxiliary projector installed at the Heligoland lighthouse by the Siemens-Schukertwerke. This rapid flash searchlight equipment at Heligoland Island is said to be most efficient, giving flashes continuously at intervals of five seconds, the beam of light having an intensity of thirty million candle power and each flash lasting about one-tenth of a second. This powerful light was installed on account of the important position of the Heligoland lighthouse at the mouth of the Elbe and on account of the dangerous condition of the waters about Heligoland Island. About 100 amperes is the maximum current utilized, which is supplied by a lead-covered cable having a conductor of 100 sq. mms. cross section, leading from the power station about 200 meters distant from the lighthouse. At this power station there are two steam-driven generator sets, each of which has a capacity of 216 amperes at a pressure of 75 volts, and is utilized for lighting purposes about the lighthouse as well as for operating the searchlight and driving the small electric motor which moves the rotary platform with the searchlight by means of a worm gearing operating in an oil bath. The projectors of this searchlight are of the horizontal type, the carbon points being at the focus of the parabolic reflectors and mounted in a horizontal position. With a medium high-water level the range of visibility is about twenty-three knots, the whole of the horizon being illuminated and most excellent results are said to have been obtained by the use of this apparatus. The platform on which the lights are mounted makes four revolutions per minute, and the three projectors mounted 120 degrees apart have mirrors of 75 cms. diameter and focal length of 250 mms. The horizontal projecting arc lamps each use a current of 34 amperes, continuous current being employed, as it gives far better results for searchlight service.

This "Filotecnica" lighthouse searchlight has a special set of three projecting focusing arc lamps and three parabolic mirrors 60 centimeters in diameter, with a focal length of 28 centimeters. The arc lamps are automatically regulated and take 50 amperes of current. The three lights are placed 120 degrees apart and throw three beams of light as noted in the illustration.

The current is supplied from a transformer of Enrico Ruberi installed at the Galleria della Marina and consists of a three-phase motor receiving current from the Exposition Power Circuit of the Societa Edison at 160 volts and with a frequency of 42 periods per second. This alternating current motor is directly coupled to a continuous current generator and drives the same at a speed of 800 revolutions per minute, developing about 27 horsepower. The dynamo generates a direct current of 115 volts pressure, supplying 156.5 amperes to the three focusing arc lamps of the lighthouse circuit equipment. An electric motor is provided for controlling the three lamps, causing the same to revolve continuously. The total light emanating from this powerful lighthouse equipment is equal to twenty million candle power and is creating great interest at the exposition which is now at its height.

The parabolic mirrors of silvered glass, as constructed at Milan by Salmoiraghi, are geometrically exact and the diverging lenses employed, together with the searchlight projector, are also utilized for army and marine service by the Italian government as well as by other European countries. The parabolic mirrors are constructed geometrically exact so as to reduce the final aberration in a spherical space of less than six millimeters diameter, and therefore are extremely satisfactory for searchlight work, allowing the use of lamps of moderate amperes without losing any effect. The parabolic mirrors are constructed in diameters from 30 centimteers to 150 centimeters and with focus of from 15 centimeters to 60 centimeters. The diverging lenses are also designed and constructed for from 30 centimeters to 150 centimeters in diameter and with 30 degrees diverging power as well as 15 degrees diverging power.

CAPITALIZATION OF RAILROADS IN THE UNITED STATES AND ABROAD.

By E. N. Percy.

There has been much talk of over-capitalization in this country, with particular reference to railroads. We propose to consider the question of railroads by comparing them with those of foreign countries and by noting improvements now in progress. For efficiency in so large an organization as a railroad, with its departments of widely diversified work, it is necessary to follow lines laid down by experience something as follows:

Definite policies and procedures must be decided upon and followed. Each department must have one head, and one only. Each road must have one head, and one only. Each agglomeration of roads must have one head, and one only.

It is recognized that combinations of an industrial nature, properly organized, tend towards efficiency and the betterment of that industry. The open question is, in the case of public utilities, does the public receive its rightful share of the results of the increased efficiency, or is the public imposed upon by large combinations, using their powers to crush competition, and make arbitrary rates on the commodity in question.

We will try to show to a greater extent than generally supposed in the case of the railroads that capital has been spent properly, that competition in the higher sense of the word exists, that the recent combinations of roads have tended to give a better service and a cheaper rate than before, and that the people are receiving a proper return for money invested in so-called "watered stock," notwithstanding the present flutter existing in the purely speculative market.

The enormous values wiped out in the San Francisco fire are partly responsible for the present money shortage; also Russia and Japan are large borrowers; but, most of all, the great prosperity of the country has tended to remove money from active circulation and place it in the hands of the people, where it now lies, in the care of savings banks and other guardians of the pocket of the common people. These institutions, or rather the people at large, do not speculate, hence Wall Street has suffered for lack of money for purely speculative purposes, and further, these institutions can not loan money for development or uncertain work of any kind, which has caused a cessation of activities of this kind on many railroads, a deplorable feature, because the country at large is growing faster than the railroads.

When on investigation one finds freight rates in France, Germany and England to be 100 per cent higher than in the United States, notwithstanding that wages are lower, the equipment and investment two to four times as great, and the dividends and interest on bonds only equal to the United States in general average, one looks for the reason or reasons.

In the first place we find that the railroads in the United States have four times as much mileage per capita as Germany, France or England. We already know that America produces more per capita than any other country. This means that the United States gives better service at lower rates, and pays higher dividends than these countries, in spite of higher wages, higher cost of material, long distances and strikes.

Taking the question of wages alone, we find that in England they are 50 per cent lower than the United States, France 65 per cent, and Germany 50 per cent. Last year, according to the "Statist," England carried 500,000 tons of freight per mile of road, on a capitalization of $271,000 for each mile. France carried 410,000 tons on a capitalization of $136,000, Germany carried 770,000 tons on a capitalization of $100,000, and the United States carried 800,000 tons on a capitalization of $64,000. It is economically apparent that this is partly due to the relatively great value of money in the United States and its lower value abroad.

Let us now consider trackage. England has 130 per cent of double track as compared to 100 per cent of single. The United States has forty-five per cent of double track as compared to single, but these figures include sidings and yards, and as our yards and sidings are numerous and enormous compared to England, we must acknowledge that nearly three-quarters of our railroads are single track.

Looking at dividends and interest on bonds, we find that England averages 3½ per cent; France, 4 per cent; Germany, 6 per cent, the average being 4½ per cent, while the United States averages 4½ per cent.

Germany may be regarded as exceptional, as the railroads are government owned. They fully meet the needs of the country; further extension is not necessary, except to a limited degree, and improvement only of existing conditions is aimed at. Years of conservative policy finds it with a perfect system of roads, the very best equipment available, and great efficiency because of this equipment. Furthermore, the owners (the government) control the business; hence their ability to pay the unusual dividends of 6 per cent. Of course, such bonds as are available in the market are so effected by the value of money that 3 to 4 per cent is all the purchaser actually realizes from his high purchase price; but the stock, owned by the government, pays 6 per cent on the original investment, over and above the huge amount devoted yearly to reserve and improvement funds.

This means that American roads carry 60 per cent more freight with 65 per cent less trackage than England, yet serve the people per capita better, pay better dividends, better wages, maintain larger equipment and do it all cheaper.

How can this possibly be? There is but one answer, better management, and investing all moneys where they will earn dividends. It seems probable that in America it is better realized that railroad opens up a country quicker and cheaper than anything else; and it is worth all costs and all risks to get railroads into a new country. In America, they are satisfied to get the road in, and get it quickly. In Europe, it must be elevated or depressed at every crossing; it must be embanked for miles; it must have a complete signal system, etc., before a train can run.

Why is this enormous investment in European roads? How is it invested, and upon what is it spent? And, most of all, why? Let us answer the last question first. When the traffic of a country can be no further expanded, and the road must wait upon the growth of the country, it can only increase its earning power by increasing its efficiency. This is done by improving rolling stock and highway.

Outside influences enter, also. These old countries of the inquisition, the reigns of terror, the towers of torture, etc., have of late years grown very careful about the safety of their subjects. Railroads must spend millions in grade crossings, gates, signals, etc., as required by law. These gallant old countries who formerly rushed to war over some slight point of honor, raise Heaven and earth over a train wreck, and look at a coin many times before investing it in railroads, and the returns must be assured. Conservatism rules everything; even colonial roads are built after the country is opened, rather than to open it up. An example of this is the struggle of the progressive German Kaiser to get the development road built in the Southwestern African Colonies of Germany. The Colonial Director, Demberg, is a practical banker, who was partly trained in America, and the scheme has his hearty support. It was on account of this question that the Reichstaag was summarily dissolved last year.

Examining the strictly engineering features, we find the road beds embanked fifteen or twenty feet high for hundreds of miles, so as to cross above grade all roads, tracks,

etc. Deep cuts have been made for the same reasons. Yet, with all of this expense, there will be found a half a dozen grades so heavy that the entire rolling stock must be adapted to them, in order to operate the road. A heavy grade rises to the tunnel near Lincoln, England, yet, by making the tunnel fifty feet lower, and two hundred feet longer, the entire grade and fill could be avoided. The reason for this appears to be a wagon road and a railroad which are both crossed above grade.

The banking and grading is of the heaviest and most solid description. Assuring it to be laid down at thirty cents a yard, for a double track embankment, we have a cost of at least $\frac{30}{5} \times \frac{15}{3} \times \frac{5280}{3} \times 30 = \$17,600$ per mile. Trestles are not piles, timber nor even steel, but arch after arch of hewn stone. Bridges are of the finest steel construction, each built for its place, not stock made, as at Pittsburg. Furthermore, the ties are never laid on the bridge girders, but carried in a bedding of cinder or gravel. It is, no doubt, as cheap and minimizes repairs, as ties laid on girders wear rapidly.

Rails are, in general, heavier than in the States. On the local roads around Berlin, where thousands of trains pass every day, the ends of the rails are cut into a bevel dovetail, fitted to each other, spliced with a special fish-plate, bolted and keyed up tight, and, except for the fish-plate, one cannot find the joint after a few days' use.

The ties are mostly small tree trunks from the artificial forests of Germany. A gum tree planted eight years ago will give a wagon-load of fine-looking ties, each about ten inches in diameter and shaved down flat on two sides. They do this with axes, in Germany, wasting the chips. It could be done with a double saw edger, saving the labor, and using the slabs for fuel to run the machine. Railroad companies could grow their own ties with small investment. Incidentally, the small branches of the tree make fine fuel, and the extract from the leaves, as eucalyptus oil, is eagerly sought by wholesale druggists and makers of boiler compounds, because of its power to dissolve and counteract alkalies and precipitates.

The rails are never set on the ties, but on a casting or foot plate, which, because of its greater area, prevents the cutting of the ties, seen so much in the United States. Spikes are not used, but these castings or forgings, as the case may be, are bolted to the tie, and the rail is wedged into place by a wooden wedge between the forks of the tie piece. The right of way is securely fenced in at all points, drained with rock-lined ditches, and grass and weeds are always cut. A good road bed of rock and cinders is found everywhere. The track is never laid on the soil or sand. In cuts, fills, or embankments, where the sides are of unprotected soil, the water cutting is prevented by digging zigzag trenches lengthways along the slope, and filling them with rock. These gather the water, and guide it to the main ditch at the bottom, without cutting.

All stations are of stone or steel. Passengers are never allowed to cross a track. Galleries, or tunnels, are always provided. The larger stations are two-story, with trains coming into the second story, and baggage rooms, cabs, etc., below. Trains enter and depart from all cities, on viaducts or subways—never at street level, except on private right of way. The Grand Central Station at Liverpool is three stories high, and includes the subway, street level, and railroad level within itself. Most large stations are of arch steel construction, single span, with no intermediate supports; swinging half arches being a favorite design, probably because of their ease of erection and roomy appearance.

In Germany, every station has a big clock, and an indictator showing the destination of each train coming, and the name of the station in prominent letters. The trains are usually on time. In England, the stations are so plastered with advertisements that one can seldom find the name; in fact, advertisers take advantage of this fact, and place the name of their product in a prominent position, where one would expect to find the name of the station. One man rode right through Birmingham, thinking it was a manufacturing suburb of that enterprising city, because the only name he could find around the station was of a well-known brand of beef extract. For local trains, the writer has become an admirer of the side door, as the trains are filled and emptied so quickly; but they must be well made, or the train will be very draughty. A sliding door might be best, on account of there being less side clearance on American roads. All main-line switches are, without exception, worked from towers, in connection with their very complete block systems. Yard switches not connected with the main lines, may be worked in place. Most switches, signals, etc., are worked by rods and wires—very few by compressed air or electricity. An electric system of signaling is in use in Germany on the locals, but these are under manual control. The trains never leave their special track, and do not signal automatically, and no other train ever goes on their track.

In Germany, they seem to favor a light, economical locomotive. Patent valve-gears, compound engines, patent fuels, and other devices, are highly developed to the end of technical economy. The English engines, while not as economical, have a solid appearance. It seems to be a favorite idea with English engineers to put the cylinders and rods between the wheels, making a crankshaft of the axle. One would think that this weakens the axle, but there is no series of accidents to condemn this argument, although a mechanic did tell the writer that they were nearly always out of line.

The cars are built of steel. The fittings and hardware are of the most solid construction. The brakes are of both the Westinghouse and rubber-disk type. The better cars have electric light, furnished by a storage battery, charged with an axle-driven dynamo. On other cars, gas is used. Some are heated by steam radiators, and some by tanks of hot water placed under the seats. The lavatories are large, and very complete; and good ventilation is secured without dust. The cars in general are much lighter, having only four or six wheels. The wheels are light, and spoked. Freight cars, open or closed, have four wheels, and are hardly larger than a good-sized four-horse truck. In the front of most of them is a high seat, with a hood, like a wagon seat, where the brakeman sits, to watch the engine—for few of these freight cars have air brakes, in Germany. In England, they are better equipped.

The fast trains, so called by courtesy, are not as fast as the fastest in America, but they are very punctual. Locals, as a rule, are not fast. They load and unload quickly, and have a comfortable way of arriving and departing frequently. Yard switching is always away from the main line until a train is sent out, and accidents of any kind are events to be remembered. At every flag station in Germany, the flagman stands in view, at military attention, while the train passes, with his folded flag at his shoulder, like a gun, or else displaying the proper signal.

The German railroads are an absolute machine; nothing breaks their inflexible routine, and one feels peculiarly safe in the cars of this systematic organization. Dinner is announced at twelve o'clock, and it is ready. The engineer is late; he tells you he will make up two minutes every half hour all day, and he does it with no wild scrambles of speed and hold-ups for repairs.

In England, the service is excellent on some roads, and execrable on others, but the machine-like uniformity of Germany is wholly lacking. A German engineer would be as surprised at a change of orders as at an order to leave the track. We have endeavored to see where and why the enormous investment in foreign roads has been expended, and why it is so inefficient as an earning power, because so much of it is invested in property which produces no dividend. Now, in reference to the roads of our own country:

Mr. Hill is accused of giving poor service, of watering stock and other very bad things. Why are these things always held uppermost, instead of the great fact that he has spanned the continent under enormous difficulties, has contributed largely to the development of the wheat lands of the United States and Canada, and has sent dozens of branch roads north and south from his great main line, when the country did not warrant it; but was broad and wise enough to take the initiative in developing this country?

Now, with a great system of single trackage, a country growing faster than his road, competition encroaching upon the land which he has made prosperous, and the system crying for development commensurable with that of its territory, we are told that "stock is watered," "over-capitalized," etc. It is a common mistake to overlook the prestige enjoyed by the road, the country it has developed, and the trade it has worked up, in making the charge of "over-capitalization."

At a recent meeting of California fruit growers, a live committee had formulated an excellent advertising campaign, in which the co-operation of the railroads was to play a large part. The whole thing fell through because a few members persisted in a ridiculous antagonism to the roads, on account of fancied high freight rates; this, by people who demand refrigerator cars, and a time limit on Eastern delivery. In many similar questions, a co-operation of mutual benefit could be effected, were it not for the petty antagonisms existent among people who do not understand the immense expense a railroad is subject to in operation and development.

Those who are disposed to criticize Mr. Harriman's methods, should compare the service in San Francisco today, with that of twelve years ago, and the effect it has had on their own particular purse. All along the lines of the Chicago Northwestern, Union Pacific, and Southern Pacific, are unbroken stretches of new ties and rails, new bridges, new embankments. Schedules are improving; yards and terminals are being built, and standards being introduced everywhere.

At the steel mills we find Harriman orders, and these orders require a larger and a better rail than has ever been made before. At the American Steel Car Company, sixty of the finest steel cars are being turned out every day for Mr. Harriman.

The Illinois Central, and every other road that has come under this management, has showed immediate improvement in service and equipment, without extra charge to the public, except through those ordinary collaterals, purchased by the public, on which a fair interest is always paid, and which will recover from the present depression, for the simple reason that their dividends, based on par value of money, and other natural conditions, will make them a desirable security to the investing public, as soon as they feel assured of their safety; and that their real value can withstand the assaults of speculators; as it is now a recognized fact that the country rules Wall Street—not Wall Street the country.

This is not intended as a defense of trusts, but merely a few facts to show that our freight rates are not excessive; that the railroads are not over-capitalized, and that they are spending available capital properly in development work.

PROGRAMME

FIFTEENTH ANNUAL CONVENTION PACIFIC COAST GAS ASSOCIATION

Santa Cruz, California
September 17th, 18th, 19th, 1907.

Officers, 1906-7.

Jno. Martin . ..... President
C. O. G. Miller ..... Vice-President
John A. Britton ..... Secretary and Treasurer
H. Bostwick . ..... Asst. Secretary and Treasurer

ORDER OF BUSINESS.

September 17, 1907.

1. Roll Call.
2. Reading Minutes, Last Session.
3. Communications.
4. Report of Secretary and Treasurer.
5. Report of Directors.
6. Report of Special Committees.
7. Report of Library Committees.
8. Balloting on Applications for Membership.
9. Appointment of Committees.
10. Miscellaneous Business.

After above order of business, papers will be read as per list following, but not necessarily in the order in which they are printed.

List of Papers to be Read.

President's Address . ..... Jno. Martin
1. A Recent High-Pressure Installation ..... E. C. Jones
2. Sulphur in California Oils ..... P. W. Prutzman
3. Repairing the Cup of a Two-Lift, 500,000 C. P. Gas Holder . . .. G. S. Colquhoun
4. Practical Suggestions from a Practical Man ..... Stephen A. Byrne
5. History of Hydro-Electric and Gas Development in Central California ..... John A. Britton
6. Comparative Economies in Operating Small Motors by Gas, Gasoline and Electricity ..... L. H. Newbert
7. One Year After ..... G. C. Holberton
8. Moving a 30,000-Barrel Oil Tank by Water .....
9. Lampblack—A Composite Paper by Several Members
10. Historical Data, Gas and Electricity .....
11. Experiences ..... R. P. Valentine
12. Wrinkles ..... Geo. S. Colquhoun
13. Novelties ..... Geo. H. Hollidge

Upon completion of reading of papers, the following will be the order of business:

1. Report of Committees.
2. Election of Officers.
3. Unfinished Business.
4. New Business.

Wednesday, September 18th.

Banquet, 7:00 p. m.—Casino.

Thursday, September 19th.

Excursion to works of Standard Santa Cruz Portland Cement Co., by courtesy of Mr. Wm. J. Dingee.

THE TURBINE AS APPLIED TO MARINE PROPULSION.*

By Charles A. Parsons.

The turbines now in general use may be classified under three principal types, though there are some which may be described as admixtures of these three types.

The compound or multiple-expansion type was the first to receive commercial application, in 1884; the second was the single-bucket wheel, driven by the expanding steam-jet, in 1888; and, lastly, a type which comprises some of the principal features of the other two combined with a sinuous treatment of the steam, in 1896.

The compound type comprises the Parsons, Rateau, Zoelly and other turbines, and has up till now been that chiefly adopted for the propulsion of ships. The distinctive features of these varieties of the compound type lie principally in design, each variation having some real or imaginary advantage in view. Nearly all adopt a line of flow of the steam, generally parallel, and not radial, to the shaft.

In the Parsons turbine there are no compartments; the blades and guides occupy nearly the whole space between the revolving drum and fixed casing, and the characteristic action of the steam is equal impact and reaction between the fixed and moving blades. One chief object in view has been to minimize the skin-friction of the steam by reducing to a minimum the extent of moving surface in contact with the steam, and another, to reduce the percentage of leakage by the adoption of a shaft of large diameter and great rigidity, permitting small working clearances over the tops of the blades. The other varieties of turbines have all multicellular compartments, in which revolve the wheels or discs. In them the skin-friction of the discs is greater, but is not considered serious, and a reduction of the percentage of leakage to a minimum has been sought in the adoption of a shaft of small diameter passing through partitions stanched by metallic packings. These latter varieties are all of the impulse type, the drop in pressure being taken on the guide-blades, and little or no difference of pressure occurring between the two sides of the wheels.

The second, or single-wheel type, though used extensively on land for small and moderate powers, has not received must application for marine propulsion, because of its high angular speed and the necessity of reduction gear on to the screw-shaft. The De Laval turbine is the chief representative of this type.

The third, or sinuous-flow, type ranks second in the extent of its application to ships, and of this type, though the Curtis turbine is the chief representative, yet to it the Riedler-Stumpf and some others also belong; generally, it may be described as semi-compound, the stages of expansion being comparatively few; at each the De Laval expanding-jet principle is used, and the energy is absorbed by transfers between a few rows of fixed and moving blades. In the Curtis variety, the revolving wheels each carry two or more rows of blades. The skin-friction of this turbine, therefore, is more than in the Parsons, but less than in the Rateau or Zoelly, with only one row on each wheel. The leakage co-efficient is also intermediate between that of these types, but the skin-friction in the blades themselves, owing to the sinuous course at high velocity, is greater than in any of the varieties of the compound type; the erosion of the blades from higher velocity of steam is also greater, though in this latter respect the conditions are more favorable than in the single-wheel type.

The total power of marine turbines of the Parsons type now completed is 385,000 horsepower, and may be summarized in the various classes of vessels as follows:

Pleasure steamers	18,200
Cross-channel steamers	149,900
Yachts	18,100
Ocean-going steamers	91,900
War vessels	106,900

The power of marine turbines of the Rateau, Curtis and other types completed is about 16,000 horsepower.

The consumption of steam in the "Turbinia" was determined by Professor Ewing in 1897 to be fifteen pounds per equivalent I. horsepower of reciprocating engines; this figure has been somewhat improved upon in the larger fast classes of turbine vessels, and by the addition of cruising turbines the consumption at the cruising speeds of war vessels has been brought to substantially the same figure as with reciprocating propelling machinery. In fast pleasure steamers and cross-channel boats the economy of the turbine has been found to be five to fifteen per cent superior to that of similar vessels with triple-expansion reciprocating engines, and about twenty-five per cent superior to vessels with compound paddle engines, so that superior speeds are rendered possible. Many minor advantages are also obtained, such as less cubical space, reduced consumption of oil and stores, and reduced work for the staff.

Turbines have been found equal or superior in economy to reciprocating engines for speeds down to about sixteen knots, and in some cases, where large and comparatively costly turbines have been fitted, such as in yachts, down to about twelve to fifteen knots.

But the solution of the problem for slow vessels undoubtedly lies in a combination of reciprocating engines and turbines, the former to deal with the high-pressure part of the expansion, and the latter the low-pressure part, covering a greatly increased total range of expansion. Such a combination, it is estimated, will effect a saving of about twelve per cent in coal, in the case of an intermediate liner of fifteen knots speed, over the best quadruple-expansion reciprocating machinery, and with a reduced weight of propelling machinery; and in a large vessel of ten to twelve knots speed a saving of fifteen to twenty per cent in coal consumption over the best triple-expansion reciprocating engine. In some cases there will be an increase of capital cost, which, it is estimated, will be recovered in less than three years by the increased earning power of the vessel; but in the larger vessels there will be little or no increase in such cost.

*Institution of Civil Engineers.

THE DANGERS OF CONTACT WITH ELECTRICAL CURRENT.

In a recent issue of the "Chemiker Zeitung," Herr Hermann Zipp, lecturer at the Municipal Polytechnic at Cothen, discusses the danger to human life introduced by accidental contact with an electrical current, and comes to the conclusion that the extent of the injury is not entirely due, as is generally imagined to be the case by non-technical people, to the voltage of the current, but partly or mainly depends on the quantity of electricity which is caused to flow through the human body and upon the parts of the system to which it penetrates. The experiments that have been carried out on the physiological influence of electrical currents show that a part of their effect is due to their electrochemical action upon the liquids of the body, and part to the injury done to the most important organs by contact with the current of electricity. The following facts have indeed already been established: (1) When a current flows from hand to foot under the worst conditions, that is to say, when a man's boots are thoroughly soaked with water and his hands are damp, the resistance of the human body is on an average 5,000 ohms. (2) When an alternating current of 5 milliamperes with 50 complete alternations per second flows through a person, the effect is sufficiently marked to produce muscular contraction; hence in the author's opinion a current of from 50 to 100 milliamperes must be undoubtedly considered as dangerous to life, provided it comes into the neighborhood of the most important organs of the body. In judging of the degree of danger exhibited by any electrical installation, therefore, the investigator has to inquire whether it is possible that a current of such volume can be introduced into the human system from any part of the plant. The chief sources of danger are, of course, a broken conductor, too highly charged a conductor, and the effect of lightning; but the following points have also to be borne in mind, viz., bad insulation or high capacity in items of the plant, and the conversion in a transformer of a high tension current into one of low voltage.

The author accordingly proceeds to discuss the various accidents that have arisen, or are liable to arise, under four separate headings. (1) Simultaneous contact with both conductors. (2) Contact with only one conductor. (3) Contact with the "charging current" in alternating installations; and (4) Dangers introduced during the reduction in voltage of a current.

1. In certain conditions, e. g., a chemical factory or a mine where the atmosphere, etc., is damp, a man may be injured by contact with a 110-volt current; because his personal resistance, being lowered to 5,000 ohms, as already stated, he may receive a current of 25 milliamperes therefrom. It is even possible in some cases, where the air is loaded with acid vapors, that the conductivity of the human skin may be greater still, so that death may be caused by contact with a current of 110 volts. In practice, however, this circumstance does not involve great risk, because it is easier to eliminate the dangers attendant upon an electrical plant than those of any other form of machinery. In the reports covering the year 1905 issued by the Prussian "Regierungs und Gewerberate und Bergbehorden" (Factory and Mining Inspectors), seven fatal cases and two severe accidents caused by electrical currents were mentioned. Two of the fatal cases were due to willful carelessness; the third was caused by a workman interfering with a transformer; the fourth to a man unnecessarily passing between a switchboard and a high-tension transformer; the fifth to a man accidentally making contact between the metal cage of a hand lamp running with an alternating current of 110 volts and a water main, the insulation of the lamp having become defective. (This accident will be referred to again later on.) In the sixth case a man slipped when he was erecting a conductor to convey a 130-volt alternating current, and made contact between it and the end of a wire lying on the ground. In the seventh case a man was killed with a 500-volt current. In one of the non-fatal cases a man touched the collector of a 120-volt machine with damp hands, and was rendered speechless for three weeks. The reports of the Prussian mining officials for the year 1905 contain accounts of ten fatal accidents in connection with electrical plants, several of which were due to gross carelessness or want of foresight. In every case where death resulted it was shown that the damp air in the workings underground was a very important factor in the case, lowering the resistance of the human body so much that a current of 220 volts was sufficient to produce death. A very curious accident occurred some years ago in the town of Cothen. The owner of a bathing establishment, who knew little of electricity, had the idea of installing an electrical bath. He fitted up a pair of electrodes at the two ends of a slipper bath, connected them with the 120-volt alternating circuit of a neighboring supply, and tested the effect upon himself. At the moment of entering the bath he received a shock from head to foot, and, owing to the resistance of his body being lowered by contact with the water, the effect was instantaneous death.

In a large number of cases simultaneous contact with the two wires of a circuit produces no effect at all, either because the man's skin is dry and so forms an excellent insulator, or because the current passes without coming near any critical organ. For example, some time ago the writer himself accidentally placed one hand between the two contact pieces of a 1,000-volt transformer in such conditions that the current passed for a distance of about two inches through his flesh. The effect was a severe shock to the system and a momentary combustion of the skin, but no further ill effects followed. If, however, the contact had been made with both hands, a current equal to 100 milliamperes would have passed through his system even if his resistance had been as high as 10,000 ohms, and death would have certainly resulted. It is, therefore, clear that arrangements should always be made to prevent the possibility of simultaneous contact with both conductors of a circuit, either by compelling the men to wear rubber shoes and gloves, or, preferably, the complete suit of clothing designed by Prof. Artemieff. This consists of a garment woven out of stout linen with a layer of fine copper wire, and is so formed as to enclose the whole body. If a man wearing this clothing makes contact with both high-tension conductors, the current passes via the copper wire and practically none enters his system.

Special care is required in using portable electrical apparatus, such as hand lamps and motors, when the atmosphere is damp. It is always possible that the insulation of such appliances, especially the boring tools used in mines, may become injured, so that the casing of the motor or the cages of the lamps may receive current—as evidently happened in the fatal case mentioned above. The best method of dealing with such apparatus is to provide the casings and cages with earth wires, but it is necessary to see that the earthing is really effective.

2. **Contact with One Conductor.**—When a man makes personal contact with the two conductors of an electrical circuit simultaneously, nearly always gross carelessness is involved; but it is a much commoner thing for him to touch one of the conductors. Inasmuch as no perfect insulator

exists, at every spot where a conductor is supported, some leakage of current to the earth occurs. The amount of leakage at any single insulator is negligibly small, but in a very long circuit, where large numbers of insulators are employed, especially in a damp atmosphere or one charged with acid vapors, the total losses of current are serious. Now, if a man standing on the damp ground touches one of the conductors, a current passes from the wire, through him, to earth, and returns via the numerous insulators of the other conductor; and the greater the number of insulators on the circuit, the more dangerous is the current that enters his body. In this particular case clearly it is not the voltage of the current which is of chief importance, but the length of the conductors in the circuit that are supported on insulators. The case mentioned above where a man received a fatal shock by contact with the wire cage of a glow lamp, could only have occurred in an extensive electric system, provided, of course, that the wiring had been done properly. The author has intentionally touched the wires of an alternating electrical current about 150 feet long, in which the pressure of the current ranged between 3000 and 5000 volts. The insulation of the conductors not being defective, he experienced no ill effects, but had the circuit been several hundred feet longer still, some harm would have been done to him. Hence it follows that arrangements should be made preventing the possibility of contact with a single conductor of any electrical plant, even if the pressure is low, except under such conditions as when a man has his hands or feet properly insulated.

3. **Contact with the "Charging Current" in Alternating Installations.**—When the two coatings of a Leyden jar are connected with the pole of an alternator they receive alternately positive and negative charges, and the quantities of electricity necessary to produce these charges must flow through the wires. The quantities of electricity pulsating in the wires under the conditions mentioned, may be termed "charging currents," and are sufficiently large to be indicated by an amperemeter, or, if the Leyden jar is large enough, by causing an incandescent lamp to glow. The larger the size of the Leyden jar, i. e., the condenser, the larger are the amounts of electricity stored in it, and the larger is the charging current. Every conductor of electricity forms such a condenser with the earth, and if a man touches one conductor, his body acts as the wire of the condenser, conveying the charging current to earth. The other coating of the condenser is the untouched conductor and is obviously connected with the source of alternating current. Hence, through the body of the man flow the charging currents of the condenser which is formed of the earth and the second condenser; and if the latter is large enough, that is to say, if the conductor is long enough, the charging current may be of sufficient volume to cause death. This charging current is the chief cause of fatal accidents when contact is made with a single high-pressure wire, because the currents due to faults in insulation, which have been previously discussed, are usually far too small in amount to be of importance. In the particular case now under contemplation the length of the distributing system is far more serious than the voltage, and it may, therefore, be said that every high-pressure installation is dangerous when only one conductor is touched, provided a man's hands or feet are not well insulated. Armored lead cables are especially dangerous, owing to their high capacity, and contact with them is likely to produce worse results than contact with a naked wire.

From what has already been stated, it is evident that, more particularly in cases where the installations are employed in a moist atmosphere, there is danger, not only in simultaneous contact with both conductors, but also in contact with one. Escape of current is particularly liable to occur from badly built switchboards and similar apparatus, although such escape can easily be prevented by proper construction. It is very necessary that new installations or enlargements to existing plants should only be made under the supervision of men who understand the matter thoroughly.

In this connection it may be of interest to quote some figures from the reports of the German factory and mining inspectors for the year 1904. According to this report, between 200,000 and 250,000 accidents occurred throughout the Empire in the year under consideration. Of these about 1000 accidents were fatal, 16 being due to electrical current and 28 to machinery shafting, etc. The figures relating to accidents in mines are very interesting, as showing how extremely few cases have been due to electricity. Some of the figures quoted in the government reports for different years are given in the following table:

Year.	Electrical Current.	Explosions.	Falls of earth, etc.
1899.	4	26	394
1900.	2	20	403
1901.	2	59	431
1902.	4	10	391

4. **Dangers of Transformation.**—In this section of his article Herr Zipp briefly refers to the danger experienced by a man who receives a current in the neighborhood of a transformer. As the insulation of a high-tension circuit is much better than that of a low-tension circuit, the current which always tends to escape from the former to earth often finds it easier to pass first to the low-tension circuit and then to earth. If, now, the resistance between a low-tension circuit and the earth is 20,000 ohms, and a man, the resistance of whose body is 10,000 ohms, approaches that circuit, he may receive a part of the current which is on its way via the low-tension circuit from the high-tension circuit to the earth. The risks, indeed, are practically the same as those when direct contact with a high-tension circuit is made accidentally.

In a final paragraph the author refers to the very high voltages (namely, such as 100,000 volts), which are not dangerous to man when the frequency of the current is very great, reaching, for example, 100,000 alternations per second; and he ascribes the harmlessness of these Tesla currents to their passage along the outer surface of a conductor, so that when the conductor in question is a human being the critical organs of his body are not affected by them.

In a later issue of the "Chemiker Zeitung," Dr. H. Danneel of Friedrichshagen, criticizes certain features of Herr Zipp's article. He takes it for granted that the physiological effect on the human body of an electrical current is due to electrolysis, i. e., to the migration of the ions in the living cells. Hence, the only important question is the number of coulombs of current which enter the system, not the number of amperes. He, therefore, regards the harmlessness of Tesla currents as due to the extremely minute quantity of electricity per phase, which causes the alteration in concentration in the cells of the human body to be insignificant. In a brief rejoinder Herr Zipp disputes the accuracy of the purely electrical view propounded by Danneel. As stated in his main article, he attributes much of the effect of an electrical current upon a person to its electro-chemical action, but the influence on the nerve centers—that is to say, the shock produced by the current—must not be neglected, and the magnitude of this shock would appear to be, to some extent, a function of the voltage.

CONCRETE TELEGRAPH POLES.*

By G. A. Cellar.

The invention of the electric telegraph created a demand, which has become universal, for a form of structure to support aerial wires to be used in the transmission of intelligence; and that demand, which came, secondarily, through the failure to operate the telegraphic circuits under ground, created an industry which has expanded to colossal dimensions.

A pole for the support of wires may be defined as a column, fulfilling in this purpose support against downward pressure; also a beam, fixed at one end and loaded at the other. In its capacity as a support for wires, it is subjected to pressures downward and laterally, and to more or less of torsion. But to fulfill the requirements for such a support as this necessitates a medium having, first a moderate strength against compression; second, a superior resiliency; and, third, long life in contact with the soil.

In the first days of the telegraph, the pole of wood was found to be far the cheapest medium for use in the support of wires, and, in the earlier days of the telegraph and later of the telephone and electric light and power, many different varieties of wood were used, varying with the native product of the different sections of the country as that product met requirements for resistance to destructive agencies encountered in the different localities. These requirements were found in greater or less perfection in the native timbers in many parts of the country, or in timbers that required transportation for only a short distance.

The chemical action of the ingredients of the various soils is largely responsible for the shortening of life of the timbers in contact therewith. Consequently, in some soils, timbers will deteriorate very much more rapidly than in others and vice versa. Therefore, the use of timbers, especially those that are native, or whose habitat is in a reasonably near vicinity to the place where they are to be used, is consistent with the greatest economy.

The arbor-vitae, or Northern cedar (Thuja Occidentalis) combines reasonable strength with resiliency and with the almost ideal tapering form necessary to afford the maximum strength at the point of greatest pressure under varied stresses, viz.—the ground and water line. This has accordingly been for many years the generally-accepted and generally used timber for telegraph, telephone, light and power lines throughout the country, where the transportation charges would not so add to the initial cost as to make the total prohibitive, or exceed the cost of some only slightly inferior native timber.

Throughout the middle East, parts of the Ohio Valley and in other localities, the chestnut is plentiful, and has quite a long life in contact with the soil. Its form is not nearly so perfect as the white cedar, but it far exceeds the latter in strength to withstand lateral stresses, although its length of life is inferior to that of the cedar, except, perhaps, in the regions where it is native.

On the Pacific Coast, sawed redwood posts have been and are still in use; and in Mexico various timbers are utilized, the process being to cut a piece of timber with rectangular section, diagonally along its broader side, from near one side at the one end to near the other side at the other end, making of such section two posts, each of large base and small top. This form of support has also been used in the construction of steel supports, by having I-beams in the same manner.

The Northern cedar, as a proposition for the supply of the immensely extended telegraph, telephone, light and power lines, has passed the safety line as a resource. The Western cedar, of which there are immense quantities, is so far away that the transportation charges make the price per pole almost prohibitive for ordinary purposes. The chestnut, considered as a supply for its native region, is to be depended upon for the immediate future, but is sadly inadequate as a supply for the whole country. Therefore, the mind instinctively turns to a manufactured article which shall take the place of the natural, and the logical time when the manufactured product shall so take the place of the natural is when the former can be produced as cheaply as the latter.

Into the question of cost enters that of length of pole life. Heretofore, the advisability of using wood-preservative to reduce or prevent the decay of the wooden poles has been considered from time to time, but the practice has not been largely established, because,

(1) The pole prices have been very low.

(2) The increased life has not been found to be commensurate with the additional expense of treating the pole in its entirety.

(3) In the building of many lines, the outlook has contemplated only moderate increases in facilities, whereas, in many instances, time has demonstrated that very much larger poles sooner or later become necessary, and, therefore, the process of deterioration only serves to take down many small lines that would have to be taken down anyhow, in order to make room for larger capacity poles.

The principal point of decay in wooden poles is at the ground and air-line, where the alternate drying and dampening induces a condition of decay which grows and grows and frays the body of the pole until it is so weakened that it has to be reset or replaced. On the lines of railroad along which a great proportion of the telegraph lines of the country are located, the unoccupied portions of the rights-of-way are kept in turf, with a view to presenting the best possible appearance, and, consequently, are subject to grass fires, especially in dry seasons, which are dangerous to standing dead timber, particularly to telegraph poles where the decayed portion at the ground line has become like tinder. Were it not for the increased liability to ignition, the application of coal tar to the poles, for a sufficient distance above and below the ground and air line to resist the inroads of decay, would materially lengthen the life of the pole, and, while this process is all right in sandy, desert countries, the grass fires in other territory precludes its general use.

Having the solution of the question of pole preservation much at heart, the writer, through the courtesy of the gentlemen of the Engineering Department of the Pennsylvania Lines West of Pittsburg, some years ago made some rather comprehensive investigations into the matter of a preservative best suited for telegraph pole uses, and, casting aside the proposition to treat the whole pole as too expensive in proportion to the benefit derived, we decided (on account of the short time until certain construction work had to be started) to undertake a compromise, by applying the preservative only to that portion of the pole extending one and a half to two feet on either side of the ground and air line. That the result justified the expense is borne out by the present condition of the poles so treated as well as by the result of the experiments by the Forest Service, Department of Agriculture, shown in the report by Mr. Henry Grinnell, Assistant Forest Inspector (reprinted from the Year-Book of the Department of Agriculture for 1905), on prolonging the life of telephone poles, and describing the experiments in several methods of treatment, from which he adduced the conclusion that, while the lapse of time since the applications were made had not been sufficient for a full report, the method of treatment, consisting of applying the preservative to the pole by brushes, was so cheap that it would certainly repay its cost by the increase of only eight months in the life of the pole. I had not until recently seen this report, and did not know of the experiments, but, confirming as it did, the results of my own trials, I feel encouraged to think that, under present price conditions, so long as we continue to use poles of wood, we shall certainly find in the increased life of the pole ample remuneration for similar treatment with any good preservative preparation, and especially one of antiseptic qualities.

*Abstract of a paper read before the Association of Railway Telegraph Superintendents in convention at Atlantic City, June 19, 1907.

In looking to a product which shall be the acme of structural possibility, the object will be to secure an architectural fabric that will last forever, and a Pittsburger instinctively feels that the first and best medium for the manufactured article will be steel. But consideration develops that the length of life of steel, without adequate preservative agencies, is not much greater than the long-lived woods. A great many patterns of steel poles have been made, but probably very few of them represent our practical desideratum. Among them are the poles cut from I-beams, referred to above; tubular poles made of pipe jointed together; tubular poles of special design and manufacture; poles made of plates bolted together; poles of angles fastened together by lattice work, and sundry other forms. But thorough study of the matter brings the conclusion that, to have sufficient long life for consideration, the inside as well as the outside of any steel pole open to the air must be accessible for the purpose of inspection and reapplication of preservatives.

So far as the writer has ascertained, the preservation of steel imbedded in properly constructed concrete is perfect. Concrete not only does not disintegrate, but hardens and improves with age. Therefore, a structure of reinforced concrete has a life that is practically unlimited, and a telegraph pole made of reinforced concrete ought for many generations to endure and answer the purpose for which it was erected. The location of pole lines along railroad rights-of-way will in the future permit the use of shorter poles for supporting the wires nearer the ground than has been practicable heretofore, because the rights-of-way of the railroads are better policed now than in the past, and in the future will be much more safely guarded. The time will soon come when persons not employed on the railroads, or whose duties do not require them to be on railroad property, will not be allowed on the rights-of-way of any railroad company. In England and on the Continent, where trespassing is not permitted, it is the practice to use very much shorter poles and place the wires nearer the ground.

The use of concrete for the manufacture of telegraph poles is not new. As nearly as I have been able to ascertain, the first concrete poles were designed by Col. G. M. Totten, Chief Engineer of the Panama Railroad Company.

After a somewhat extensive series of experiments made some time since, Mr. J. L. Weller, member of the Canadian Society of Civil Engineers, and Superintending Engineer of the Welland Canal, built and erected a power line along the Welland Canal, using reinforced concrete for the manufacture of the poles. The poles in this line stand from forty-five to seventy feet in height, and were designed to withstand a horizontal pull at the top equivalent to two thousand pounds. These poles have been standing in the line for more than three years and are apparently in good condition. I am informed that Mr. Weller also built a line of concrete poles forty to sixty feet in height for the Niagara Falls Power Company, and a line twelve miles long, from DeCow Falls to Welland, for the Hamilton Cataract Light, Power and Traction Company, the poles running from thirty to forty feet in height above the ground. Short, heavy stubs are used to carry the line over the gorge at DeCow Falls, and poles sixty-eight feet high carry the span of four hundred feet crossing the Welland River. The latter are erected in the center of square concrete piers on pile foundations, and are capable of standing an immense strain. He also made a pair of concrete poles one hundred and fifty feet in height for the Lincoln Electric Light and Power Company, to carry that company's wires over the old Welland Canal at Lock Three, St. Catherines, Ontario. These poles are eleven inches square at the top, thirty-one inches square at the base, and weigh forty-five tons each. They are made, not built up from the base like the towers at Brownsville, Pa., above referred to, but horizontally on the ground, and, as is the practice with wooden poles, raised into position. Of course, their extreme height and weight made it necessary to use special apparatus for their erection. Mr. Weller's processes of reinforcement are covered by patents.

The foregoing tends to show that the comparative price of the native woods with that of the manufactured pole is subject to considerable of a sliding scale as the life of the wooden pole is of short duration, as compared with the

Some of the problems confronting the initial manufacture of concrete poles were:

(1) Shall the poles be made of such dimensions as to necessitate a concrete foundation, or of such size and shape that they will be securely held in ordinary earth by thorough tamping?

(2) Shall they be made in a yard and then distributed, or shall the material be transported to the various locations in which the poles are to stand and the poles be made there?

The experience of late years on all lines of railroad is, that the expansion of track and other improvements have made it necessary to move to new right-of-way lines so many telegraph poles that, in planning for a pole of infinite life, it would be better, if possible, to procure a type which would be secure without the foundation which would render its location when once set up a permanent fixture, and this type would be preferable to the fixed type,

(a) Because of its smaller cost of construction;

(b) Because of its small cost to set up in the line, and

(c) Because it will be easily removed to a new location.

The second question was decided in favor of the manufacture of poles in yards, because their construction at the points at which they are to be set involves the transportation to these points of not only the solid materials to be used in their manufacture, and shelter for these materials, but also the water, which is not ordinarily available, and the forms. In fact, a very considerable additional physical property in the crude materials proportionate to the smaller sum total of the finished product.

On busy railroads, construction at the point of setting would involve the assembling of the apparatus on a car, the use of motive power, and the obstruction of the main track to a certain degree. This being the case, the alternate plan does not require any more apparatus or crew, will not require the services of a locomotive and crew as long, or for any longer time than the plan of making the poles at the place where they are to be set up; but it involves in addition, perhaps, the use of a derrick to be mounted on a car, the beam of which shall have sufficient radius to reach the line on which the poles are to be set. The procedure to be followed would then preferably be to manufacture the poles in a yard and have them thoroughly seasoned there before moving. In preparing for distribution, they should each be tagged or otherwise have a destination or location attached to each one, indicating the exact site in which the surveyor or inspector has designated each to be set, on account of the necessities for grading the line. The poles should then be loaded by the use of the yard derrick or a derrick car, be taken out by a train, and by the crew of the derrick set up in their permanent places in the line, in holes previously dug for their reception. This plan will require very little if any more obstruction of the main track than the stoppages requisite for the unloading of seasoned cedar poles.

As a result of a number of comparative experiments with white cedar and cement poles, it was found that a 30-foot, square concrete pole with 14-inch base and 8-inch top would stand a slightly greater horizontal pull before breaking than would a similar wooden pole. The white cedar poles broke about seven feet above the foundation, while the concrete poles failed by crushing of the concrete at the foundation level.

Approved Electrical Devices

This department from time to time will contain an illustrated description of all fittings approved by the Underwriters' National Electric Association.

ATTACHMENT PLUGS, FUSELESS.

"Tregoning" 3A, 250 V. Two piece, separable porcelain cap. Approved August 14, 1907. Manufactured by

The Tregoning Electric Mfg. Co., Cleveland, Ohio.

CONDUIT BOXES.

"Condulets." All types and sizes for conduits ½-inch to 3-inch, inclusive, for exposed work only. Approved August 14, 1907. Manufactured by

Crouse-Hinds Co., Syracuse, N. Y.

"Fancleve" cast-iron offset boxes, for rigid conduit. Approved August 12, 1907. Manufactured by

John L. Gleason, Jamaica Plain, Mass.

CONDUIT BOXES, FLOOR OUTLET.

Electric Supply Co.'s floor outlet box. Iron box, adjustable ring, brass cover and fittings, with porcelain receptacle mounted on stirrup. Approved August 20, 1907. Manufactured by

Electric Supply and Construction Co., Columbus, Ohio.

Fountain Universal Floor Outlet Box. Approved August 20, 1907. Manufactured by

John Fountain, Jr., New York, N. Y.

Fullman water-tight adjustable floor outlet box. Iron box, adjusting ring, brass floor plate and nozzle. Approved August 20, 1907. Manufactured by

Steel City Electric Co., Pittsburg, Pa.

G. E. "Adjustable" and "P. R." Water-tight Floor Outlet Boxes. Cat. Nos. 76,471 and 76,459. Approved August 20, 1907. Manufactured by

General Electric Co., Schenectady, N. Y.

Knickerbocker Water-tight Floor Outlet Box. Iron box and floor plate. Adjustable brass casing for Hubbell special attachment plug. Approved Aug. 20, 1907. Manufactured by

Lord Electric Co., New York, N. Y.

Russell Water-tight Floor Receptacle, with plugs protecting cone and flush cap. Approved August 20, 1907. Manufactured by

Russell & Stoll Co., New York, N. Y.

"Simplex" Floor Receptacle or box, No. 3,000, 3A, 250 V. Cast-iron box with brass floor plate and cap. Approved August 20, 1907. Manufactured by

Stanley & Patterson, New York, N. Y.

FIXTURES.

"Taussig" Show Case and Wall Case Reflectors. Metal troughs filled with standard sockets for incandescent lamps. Wiring in tubes or channels of No. 18 metal. Approved June 19, 1907. Manufactured by

J. Taussig, Chicago, Ill.

FUSES, CARTRIDGE, ENCLOSED.

G. E. Cat. No. 32,579. Small glass tube fuses, 2 A., 250 V. Approved August 14, 1907, for rosettes, attachment plugs, and for protection of instruments and pilot lights on switchboards. Present specifications do not admit the use of this pattern, as substitute for standard cartridge fuses. See, however, note preceding Rule 53-d, and 2-e, fine-print note.

GROUND CLAMPS.

Blackburn Ground Clamp. A metal strip secured to pipe by set screw. Approved August 20, 1907, for use only on signalling systems. Manufactured by

Geo. R. Blackburn, Cleveland, Ohio.

"Griptite" Ground Connecting Clamp. Sizes for ½-inch to 3-inch pipe; made of one piece of hard-drawn copper tubing, flattened and bent to fit pipe. Approved August 20, 1907. Manufactured by

Novelty Electric Co., Philadelphia, Pa.

G. E. GROUND CLAMP.

Ground Connection Pipe Clamps. Removable lugs bolted to strip bronze clamps, all sizes. Cat. Nos. 43,525-

43,530, inclusive. Approved August 20, 1907. Manufactured by

General Electric Co., Schenectady, N. Y.

"G. V." Ground Clamps. Type A. Sizes for ½-inch to 3-inch pipe. Approved August 20, 1907. Manufactured by

Gillette, Vibber & Co., New London, Conn.

"Neco" Ground Connecting Coupling. Sizes from ½-inch to 3-inch pipe, made in a solid copper casting to screw on pipe ahead of coupling. Approved August 19, 1907. Manufactured by

Novelty Electric Co., Philadelphia, Pa.

New York Ground Clamp. Approved August 20, 1907, for use only on signalling systems. Manufactured by

Yonkers Specialty Co., Yonkers, N. Y.

"O. K." Ground Clamp. A copper band with lug for soldered connections and screws for tightening. In sizes ½-inch to 3-inch. Approved August 20, 1907. Manufactured by

The Pettingell-Andrews Company, Boston, Mass.

"Shawmut" Ground Connection Clamps, Cast and Stamped Metal Clamps; also Shawmut type "C," one piece copper clamp with removable lug. Approved August 20, 1907. Manufactured by

Chase-Shawmut Co., Newburyport, Mass.

PANELBOARDS.

Post-Glover, 125 and 250 V., cartridge and link fuse cut-outs. Double-pole knife and snap switches. Approved August 14, 1907. Manufactured by

Post-Glover Electric Co., Cincinnati, Ohio.

ROSETTES, LINK FUSE.

"Tregoning." 2 A., 125 V. Cleat type, Cat. No. 230; and concealed type, Cat. No. 232. Two-piece porcelain rosettes. Approved August 14, 1907. Manufactured by

The Tregoning Electric Mfg. Co., Cleveland, Ohio.

"Tregoning." 3 A., 250 V. Cat. No. 233. A one-piece porcelain cleat rosette. Approved August 14, 1907. Manufactured by

The Tregoning Electric Mfg. Co., Cleveland, Ohio.

SOCKETS, WEATHERPROOF.

"Federal." Porcelain weatherproof socket; Cat. No. 309. Approved August 14, 1907. Manufactured by

The Federal Electric Co., Chicago, Ill.

The JOURNAL of ELECTRICITY
POWER AND GAS
WITH WHICH IS INCORPORATED
The Engineers' Architects' and Builders' News

Published Weekly by

THE TECHNICAL PUBLISHING COMPANY

SUCCESSORS TO
The Journal of Electricity Publishing Company
304 Atlas Building, San Francisco.

Yearly subscription, $2.50. Single copies, 10 cts. Back numbers prior to the current month, 25 cts. Foreign subscription, $4.00. Subscriptions cannot be begun with back numbers.
Manuscripts submitted must be accompanied by postage to insure return.

Address all communications and make all remittances payable to The Technical Publishing Company.

EASTERN AGENCIES
NEW YORK
CHICAGO
ST. LOUIS

WESTERN AGENCIES
LOS ANGELES
PORTLAND
SEATTLE

Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," with which is incorporated "The Engineers', Architects' and Builders' News."
Entered as second-class matter at the San Francisco Post Office, August 15, 1899.
Entered as "The Electrical Journal," July, 1895.
Entry changed to "The Journal of Electricity," September, 1895.

VOL. XIX SEPTEMBER 14, 1907 No. 11

EDITORIAL.

DEPRECIATION.

One of the most difficult items to estimate in connection with the cost of operation of any large plant is generally known as depreciation. The word is used in a very wide sense, but, ordinarily, it is made to include all charges beyond ordinary working costs, and must cover the reduction or loss in value of the real assets of the undertaking.

From an engineering standpoint it can be considered in two different ways. For instance, if a complete plant represents an investment of $100,000, and its probable life is twenty-five years, the sum of $4,000 per year may be set aside annually from the gross receipts, thereby annually reducing the book value of the plant at the beginning so that the entire investment is cancelled at the end of the twenty-five years. Of course, it is not necessary that this amount annually shall be taken from the business, but rather in determining the operating costs this amount, or a similar sum, should, along with other items, be taken from the gross receipts in order to obtain the net annual income.

A second method is to actually invest the depreciation fund each year in securities, so that at the expiration of the period representing the total life of the plant, the original investment will be entirely wiped out or covered by the securities so purchased.

Naturally the most important point in the consideration of depreciation is the life of the different classes of machinery and apparatus which go to make up the operating plant.

Mr. Robert Hammond has recently contributed an article to the "Journal of the Institution of Electrical Engineers of London," wherein he makes bold to definitely set forth the probable life of the different pieces of apparatus ordinarily found in an electric light and power plant. The development of electrical engineering enterprises has been so rapid, and the working conditions have been subject to such great changes, that naturally no standard method has as yet been determined for dealing with the question of the probable life or period of time during which the different pieces of apparatus can be wisely used. In the beginning it must be said that the life of any piece of machinery depends more upon the way in which it is installed and maintained than upon all other conditions put together. In electrical engineering enterprises, in addition, small and inefficient machines have been rapidly replaced by larger and more efficient apparatus, the change invariably resulting in the reduction of the total annual cost of operation.

The following table, taken from Mr. Hammond's paper, while specifically applying to but few installations, indicates in general the probable life of the different types of apparatus usually found in a steam-driven electric power plant:

Estimated Years of Life.

	Years.
Land and Buildings	60
Machinery and Plant:	
Boilers	20
Pumps and Pipework	25
Conveyors	10
Engines	25
Turbines	20
Dynamos and Alternators	25
Motors	20
Tools and Sundries	10
Accumulators	15
Transformers, Static	25
Converters, Rotary	20
Switching Apparatus and Instruments	20
Meters	10
Mains:	
Armored	25
"Solid" System	30
"Ducts" System	30

On the basis that the different parts of the operating plant are carefully maintained and all repairs made as soon as needed, it is possible that the periods of time set forth above are not far from the conditions to be found in the best plants in America as installed at the present time. If one considers, however, the plants now in operation which have been installed during the past thirty years, it is questionable if the

life of each portion of the plant, as above set forth, is not much greater than the experience of electrical engineers and investors has shown to be the case.

A careful investigation of depreciation charges has one very desirable result, namely, that the character of plants installed now is far superior to the older installations. In the rapidly growing industry of electric light and power generation and distribution it is undoubtedly advisable at times to make temporary installations that are to be in use for but a few years, the original plan contemplating the replacing of such with superior equipments as the load increases and the earnings justify the investment. This is particularly true in hydro-electric plants, and it is with satisfaction that we see the introduction of cement-lined tunnels and steel towers in place of the temporary flumes, ditches and wooden pole lines in almost all of the electric power transmission systems now being installed.

Every engineer and investor, as a result of his individual personal experience, has an idea which can, for the case considered by him, be depended upon as indicating the probable life of the different parts of an operating system. Assuming a given standard of construction it will probably not be long before it will be possible to, with a reasonable degree of accuracy, make estimates which will in most cases cover depreciation charges with the result that the net earnings of the plant can be depended upon each and every year.

A MODEL MANUFACTURING COMPANY.

It is not often that a manufacturing company can celebrate its golden anniversary under the desirable circumstances surrounding the Mueller Manufacturing Company, of Decatur, Ill.

More than fifty years ago, H. Mueller was engaged as a workman in making taps to gas and water mains, and inserting gas and water cocks under pressure. His industry and ability made possible vast improvements in such devices, and his inventions marked the beginning of the present company, which is now one of the largest in the country which manufactures all kinds of water, gas and plumbing goods.

The original founder of the company has six sons, all of whom are now directly identified with the firm.

On September 7th, at Mechanicsburg, Ill., the golden anniversary of the company was celebrated. All of the employes were given full pay, were furnished all transportation, and a full holiday.

The material manufactured by this company is used all over the world, and from the very beginning nothing but progress in the manufacture and construction of the best materials has been the object of the corporation. It is a pleasure to extend greetings to a company of this character, particularly at the present time, when stock manipulation and frenzied finance seem in many cases to have taken the place of good honest effort to produce the best appliances, no matter what the cost may be.

PREJUDICE AND FAIRNESS.

A spirit of lawlessness is not necessarily confined to personal physical conflict. Its influence may be found in many other places. When personal prejudice cannot be uprooted the due process of law is menaced, and a normal course of justice is seriously obstructed. One of the dangers of the public press lies in the practice of lawlessness and unfairness when the public is daily treated to untruthful statements regarding its best known citizens.

Not long ago one of the leaders in the commercial activity of San Francisco, and a man who has stood out most valiantly against the worst element of the labor unions, was accused in one of the city papers of having conspired with the ex-Mayor and the Secretary of the local branch of the Union, in precipitating the late street car strike. Anyone of ordinary intelligence could not fail to appreciate the malice contained in, as well as the untruth of such an accusation. Fortunately, little serious attention has been given to the matter by anyone, nevertheless, it is most unfortunate that such misrepresentation is possible without some recourse on the part of the injured person.

It is time that such attempts to influence public opinion should cease. No matter what may be the accusation against anyone, he is entitled to have an absolutely fair and impartial trial. It is unfortunate that any publication should stoop so low as to invent and print such a story without being immediately called upon to prove every statement made.

PERSONAL.

R. H. Thompson is city engineer of Seattle, Wash.

Wallace H. Fawcett is now with the Washington Water Power Co., at Spokane, Wash.

W. N. Dill is the traveling representative on the Pacific Coast of H. Mueller Mfg. Co. of Decatur, Ill.

H. D. Boschken, of the Garden City Electrical Co. of San Jose, was in San Francisco during the past week.

Elmer G. Elliott has been appointed constructing engineer for the Selby Smelting & Lead Co., at Selby, Cal.

Con. Roman, for many years with the Southern Pacific Company, is now with The Lilley & Thurston Company, 82 Second Street, San Francisco.

Frank Huff, chief electrician of the Nevada Con. Mining & Milling Co., Wadsworth Light & Power Co., and Olinghouse Light & Power Co., has returned to Wadsworth, Nevada, after a brief stay in San Francisco.

Charles N. Black, general manager of the Metropolitan Street Railway Co., of Kansas City, is to be the new general manager of the United Railroads, of San Francisco, to take the position made vacant by the death of General Manager Chapman.

TRADE CATALOGUES.

Monthly Bulletin of The Ohio Brass Co., of Mansfield, Ohio, contains its usual quota of interesting information and valuable data on street railway equipment.

H. W. Johns-Manville Co. send leaflets describing Transite Asbestos Linings for Railway Controllers, and Vanda Sheet Packing.

LOCAL STOCKS AND BONDS

Furnished by Courtesy San Francisco Stock and Bond Exchange.

Outstanding	INTEREST	MISCELLANEOUS BONDS.	SEPT. 6		SEPT. 7		SEPT. 10		SEPT. 11		SEPT. 12	
			Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked
1,532,000	F & A	Associated Oil Co. 5%	.....	80	.....	80	.....	80	.....	80	.....	80
2,250,000	M & S	Bay Counties Power Co. 5%	.....	93	.....	93	.....	93	.....	93	.....	93
1,000,000	F & A	Cal. Central Gas & El. 5%	.....	100	.....	100	.....	100	.....	100	.....	100
9,600,000	M & S	Cal. Gas & El. Gen. M. & C. T. 5%	.....	77 ½	.....	76	74 ¾	75 ½	74 ¾	75 ½	74 ¾	75 ½
900,000	J & J	California St. Cable Co. 5%	.....	102 ½	.....	102 ½	100	102 ½	100	102 ½	100	102 ½
2,000,000	J & J	Contra Costa Water Co. 5%	.....	100 ½	.....	100 ½	.....	100 ½	.....	100 ½	.....	100 ½
1,000,000	J & J	do do Gen. Mtg. 5%	.....	96	.....	96	.....	96	.....	95	.....	95
623,000	F M A N	Edison Light & Power 6%	109	112	109	112	109	112	109	112	109	112
650,000	M & S	Ferries & Cliff Ho. Ry. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
671,000	A & O	Geary St. Ry. 5%	52	.....	52	.....	52	.....	52	.....	52	.....
610,000	M & N	Honolulu R. T. & L. Co. 6%	105 ½	.....	105 ½	.....	105 ½	.....	105 ½	.....	105 ½	.....
300,000	A & O	Lake Tahoe Ry. & T. Co. 5%	.....	102 ½	.....	102 ½	.....	102 ½	.....	102 ½	.....	102 ½
500,000	J & J	Los Angeles Elec. Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100
1,300,000	J & J	Los Angeles Gas & Elec. Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100
5,000,000	A & O	Los Angeles Ry. 5%	109 ½	.....	109	.....	102 ¾	.....	109 ½	110 ½	109 ½	110 ¼
1,000,000	A & O	Los Angeles Lighting Gd. 5%	.....	103	.....	103	.....	103	.....	103	.....	103
1,500,000	A & O	Los Angeles Pac. R. R., 1st Con. Mtg. 5%	102 ¾	103 ¼	102 ¾	103 ¼	102 ½	103	102 ½	103	102 ½	103
3,030,000	M & S	L. A. Pac. R. R. of Cal. 5%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3,000,000	J & J	Market Street Cab'e 6%	.....	108 ½	.....	108 ½	104	108	104	108	104	108
5,141,000	M & S	do Ry. 1st Cons. Mtg. 5%	.....	102	.....	102 ½	.....	102	.....	102	.....	103
100,000	A & O	Mill Valley & Mt. Tamalpais S.Ry.5%	103	.....	103	.....	103	.....	103	.....	103	.....
4,751,000	A & O	Northern Ry. Co. of (Cal.) 5%	.....	113	.....	113	.....	113	.....	113	.....	113
1,498,000	J & J	North Pacific Coast R. R. 5%	100	101 ½	100	101 ½	100	101 ½	100	101 ½	100	101 ½
1,074,000	J & D	Northern Cal. Railway 5%	105	.....	105	.....	105	106	105	106	105	106
980,000	J & D	Northern Cal. Power Co. 5%	.....	97 ½	.....	97 ½	.....	97 ½	.....	97 ½	.....	97 ½
6,000,000	A & O	Northern Electric Co. 5%	.....	97 ½	.....	97 ½	.....	97 ½	.....	97 ½	.....	97 ½
1,000,000	M & S	Oakland Gas Light and H. 5%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,374,000	J & J	Oakland Transit Co. 6%	109 ½	.....	109 ½	.....	109 ½	.....	109 ½	.....	109 ½	.....
1,600,000	J & J	Oakland Transit 5%	104	.....	104	.....	104	.....	104	.....	104	.....
1,326,000	J & J	Oakland Transit Con. 5%	.....	103	.....	103	.....	103	.....	102 ½	.....	102 ½
7,000,000	J & J	Oakland Traction Con. 5%	.....	99 ½	99	100	99	100	.....	99 ½	.....	99 ½
1,500,000	J & J	Oakland Water Co. gtd. 5%	.....	99 ½	.....	99 ½	.....	99 ½	.....	99 ½	.....	99 ½
2,000,000	A & O	Omnibus Cable Ry. 6%	.....	112	.....	112	.....	112	.....	112	.....	112
1,149,000	S D M J	Pacific Gas Imp. 4%	.....	95	.....	95	.....	95	.....	95	.....	95
8,494,000	J & J	Pacific Electric Ry. Co. 5%	.....	104	.....	103 ¾	.....	103 ½	.....	103 ½	.....	103 ½
4,491,000	J & J	Pacific Light & Power Co. 5%	.....	98	.....	98	.....	98	.....	98	.....	98
3,000,000	J & J	Pacific Tel. & Tel. Co. 5%	.....	103	.....	103	.....	103	.....	103	.....	103
350,000	J & J	Park & Cliff House Ry. 6%	.....	104	.....	104	.....	104	.....	104	.....	104
250,000	J & J	Park & Ocean R. R. 6%	.....	104	.....	104	.....	104	.....	104	.....	104
700,000	M & S	Powell Street Railway 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,500,000	M & N	Sacramento Elec. Gas & Ry. 5%	100	101	100	101	100	.....	100	101	100	101
6,000,000	A & O	S. F. & S. J. Valley Ry. 5%	.....	113	.....	113	.....	113	111 ½	.....	111 ½	.....
3,000,000	J & J	S. F., Oak. & San Jose Ry. 5%	103 ¾	104 ½	103 ¾	104 ½	103 ¾	104 ½	103 ¾	105	103 ¾	104 ½
1,500,000	J & J	do do 2d Mtg. 5%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,500,000	A & O	S. J. & S. Clara Co. R. R. 4 ½%	.....	95	.....	95	.....	95	.....	95	.....	95
642,000	A & O	Sierra Ry. of Cal. 6%	105	.....	105	.....	104 ½	.....	104 ½	.....	105	110
6,000,000	J & J	S. P. R. R. of Arizona 6% (1909)	101	.....	101	.....	101	.....	101	.....	101	.....
4,000,000	J & J	do do do (1910)	102	102 ½	102	102 ½	102	102 ½	102	102 ½	102	.....
5,116,000	A & O	S. P. R. R. of Cal. 6% (1912)	108	.....	108	.....	108	.....	108	.....	108	.....
4,127,500	M & N	S. P. R. R. of Cal., 1st c. gtd. 5%	.....	118	.....	118	.....	118	.....	118	.....	118
3,533,000	A & O	S. P. Branch Ry. of Cal., 6%	124	125	124	125	124	125	124	125	124	125 ½
81,178,000	J & J	S. P. R. R. Co., 1st Ref'd'g. 4%	.....	88 ½	.....	88 ½	88	88 ½	88	88 ½	.....	88 ½
17,500,000	J & D	Spring Valley Water Co. Gen. Mtg. 4%	85 ½	.....	86	.....	85 ¾	.....	85 ½	.....	85 ¼	.....
300,000	M & S	Stockton Gas & Elec. Co. 6%	100	.....	100	.....	100	.....	100	.....	100	.....
2,000,000	J & J	United Gas & Elec. Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100
20,000,000	A & O	United R. R. of S. F. 4%	.....	70 ¼	.....	70 ½	.....	70 ½	69 ¼	70	.....	70 ½
2,500,000	M & N	Valleys Counties Power Co. 5%	.....	95	.....	95	.....	95	.....	95	.....	95
		Water Stocks.										
.....	.....	Contra Costa	.....	62	.....	62	.....	62	.....	62	.....	62
6,000	Quarterly	Marin County	45	55	45	55	45	.....	45	.....	45	.....
280,000	.....	Spring Valley Water Co.	22 ½	.....	23	23 ½	23	23 ½	23	23 ¼	.....	23 ¼
		Gas and Electric Stocks.										
37,500	.....	Martel Power Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9,340	.....	Mutual Electric Light Co. (Ctfs.)	4 ½	.....	4 ½	.....	4 ½	.....	4 ½	.....	4 ½	.....
37,336	.....	do (Extended Ctfs.)	13	.....	13	.....	13	.....	13	.....	13	.....
40,000	Monthly	Pacific Lighting Co.	65	75	65	.....	65	68	64 ¾	70	65	.....
12,000	.....	Stockton Gas & Elec. Co.	52	.....	52	.....	52	.....	52	.....	52	.....
		Street Railroad Stocks.										
10,000	.....	California	.....	140	.....	140	.....	140	.....	140	.....	140
10,000	.....	Geary	.....	30	.....	30	.....	30	.....	50	.....	30
10,000	.....	Presidio	.....	25	.....	25	.....	25	.....	25	.....	25
	Semi-an.	Associated Oil Co.	30 ½	30 ½	30 ¾	31	31	31 ½	30 ½	31 ¼	.....	31
1,625	Quarterly	Mill Valley & Mt. Tamalpais S. Ry.	.....	110	.....	110	.....	110	.....	110	.....	110
180,000	Quarterly	Pac. Tel. & Tel. Co. (Pfd.)	80 ½	85	80	85	81	85	81	85	81	85
180,000	.....	Pac. Tel. & Tel. Co. (Common)	10	11 ½	10	11 ½	10	11 ½	10	11 ½	10	.....

Unlisted Securities

750,000	A & O	Bay Counties Power Co. 6%	97	.....	97	.....	97	.....	97	.....	97	.....
745,000	M & S	Blue Lakes Water Co. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,000,000	A & O	California Northwestern Ry. 5%	.....	108	.....	108	.....	108	.....	108	.....	108
160,000	J A J O	Marin County Water 5%	.....	100	.....	100	.....	100	.....	100	.....	100
600,000	J & J	Risdon Iron Works 5%	.....	100	.....	100	.....	100	.....	100	.....	100
500,000	M & S	S. F. Dry Dock 5%	.....	109	.....	109	.....	109	.....	109	.....	109
8,000,000	M & N	S. F. Gas & Electric 4 ½%	.....	95	.....	95	.....	95	.....	95	.....	95
3,926,000	J & J	S. F. & North Pacific Ry. 5%	.....	104	.....	104	.....	104	.....	104	.....	104
5,500,000	J & J	South Pacific Coast Ry. 4%	.....	95	.....	95	.....	95	.....	95	.....	95
.....	.....	Standard Electric Co. 5%	.....	80	.....	80	.....	80	.....	80	78 ½	.....
.....	.....	do do Gtd. 5%	.....	85	.....	85	.....	85	.....	85	.....	85
750,000	J & J	Sunset Tel. & Tel. Co. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,250,000	A & O	Sunset Tel. & Tel. Co. 5%	.....	103 ½	.....	103 ½	.....	103 ½	.....	103 ½	.....	103 ½
1,000,000	M & N	Sutter Street Railway 5%	.....	103	.....	103	.....	103	.....	103	.....	103
		Stocks.										
50,000	Monthly	Gas Consumers' Association	.....	21	.....	21	.....	21	.....	21	.....	18
100,000	Monthly	Northern Cal. Power Co.	24	25	24	25	24	25	24	25	24	25
.....	.....	Pac. Gas & Elec. (Pfd.)	44	.....	44	.....	44	.....	.....	.....	.....	.....
.....	.....	Santa Cruz Port. Cement	.....	48	.....	48	.....	48	.....	48	.....	48
.....	.....	Standard Port. Cement (New)	.....	50	.....	50	.....	50	.....	50	.....	50
50,000	Monthly	Truckee Electric Co.	14 ½	15 ½	14 ½	15 ½	.....	15 ¼	.....	15 ¼	.....	15 ½

INDUSTRIAL

ELECTRICALLY SELF-HEATED TOOLS.

Tools which need to be heated have been used in the industrial arts since ancient times and the method of warming the tool has been ever the paramount consideration. There has been the old crude fire or furnace age, the gas age, and now the electrical age.

Soldering was first accomplished by the use of irons heated in coal, wood or charcoal fires. Charcoal stoves were developed which, even at the present day, are used by many plumbers and other mechanics. Of late years gas and gasoline furnaces have been greatly improved and thousands are used for heating soldering and branding tools. Recently iron soldering tools have been superseded by copper tools, since copper absorbs and conducts heat the more readily. Electric heating eliminates fire risks, vitiation of the atmosphere, and the difficulty of keeping fires alive in the wind. It is almost impossible to maintain furnace-heated soldering

EXHIBITION RACK SHOWING ASSORTMENT OF "VULCAN" SOLDERING COPPERS

coppers at exactly the right temperature. Removed from the furnace, the tool cools quickly. Likewise it is difficult to avoid burning off the tin from the tip in case of a few minutes overheating in the flame. The necessity of operating these tools, interchanging them to keep the one in use at the right temperature, and the loss of time occasioned in making these changes greatly reduces the working capacity of an outfit.

The advent of the electrically self-heated tool has not only eliminated the evils of the furnace-heated and gas self-heated tools, but has brought into existence no new disadvantages. Due to the widely spread electrical systems of the day, the advantages of the electrically self-heated tool and the facility of its use are increased, as is also the scope of its utility. It is obvious that the proper application of electricity to any mechanical unit raises its economy and efficiency immeasurably above the former condition under older heating and power systems.

The electrically self-heated tool is a greater advance over the gas self-heated tool than was the gas self-heated tool an improvement over the furnace-heated tool.

There are now being placed upon the market practical electric soldering and branding tools and appliances by the Vulcan Heating Company, 71 West Jackson Boulevard, Chicago. Vulcan branding and soldering tools have created a favorable impression and have been adopted promptly by

SMALL "VULCAN" BRANDING TOOL IN PROTECTIVE REST. LARGE BRANDING TOOL USED BY SWIFT & CO.

progressive concerns because they have achieved the before-

SMALL "VULCAN" BRANDING TOOL IN REST FOR CONVENIENT BRANDING OF SMALL FLAT OBJECTS SET IN MOVABLE HOLDER

mentioned advance over the gas tools and attained that

desired economy and efficiency.

The advantages, the special nature, and the fields to which these tools pertain will be treated in succeeding paragraphs.

A LONG SLENDER "VULCAN" COPPER FOR SWITCHBOARD WORK

1. Electric soldering and branding tools have a connection by a flexible cable to the nearest electric circuit, the troublesome torch is done away with and the convenience in handling can hardly be improved.

2. For use in cramped positions, and especially in close quarters in hot weather, the electric implement is immeasurably superior to the old-fashioned devices.

3. There is no danger of injury to the tool from overheating. The old furnace-heated soldering coppers had to be watched very closely.

4. A workman becomes the more expert as a result of the foregoing advantages. He gets used to certain dependable results produced with constant regularity. He has no trouble from overheating, from the cooling off of the tool at a critical moment, from manipulating a fiery blow-torch in a dusty corner where the flame may start a destructive fire. He is always at his ease, the tool is always handy and in position, and he can work (a) with more speed and (b) with more effect. He can accomplish more than he could with the use of two coppers under the former system.

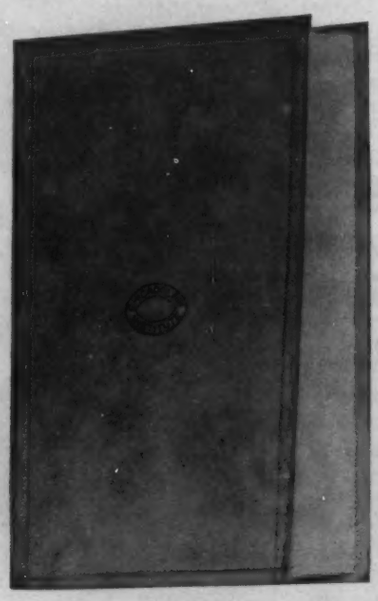
"VULCAN" BRANDING TOOL, PORTABLE MOUNTING, USED WITH STEEL GUIDES FOR BRANDING NUMBERS ON TELEPHONE BOXES

5. The ease with which electric heat is transmitted and controlled, the flexibility of connections, the uniform and continuous heat supply, the steady and reliable results, never failing, the resultant saving in dollars, time and tissue, and the increased quantity of work which may be depended upon, can not fail to bring about further the general adoption of electrically-heated tools in preference to all others.

Soldering Tools in Telephone Work.

A careful study of the possibilities of uniformly reliable soldering brings the conclusion that there is no excuse for defective soldered joints in telephone switchboards, any more than there is in making tinware or other commodities. With clean and properly tinned wire and terminals, rosin core solder and a properly tinned soldering tip of the right temperature, held in contact sufficiently long to heat the parts, a defective joint is practically impossible. There is no reason why all soldering in the manufacture and maintenance of telephone apparatus should not be done under these conditions.

When the self-heated tool is used, a superintendent is enabled to furnish tools to his men which can not be other than at the right temperature. He can furnish heavy tools for heavy work and light tools for light work. He can furnish hot tools for fast work and cooler tools for slow work. Whatever the needs may be, he is able to investigate and determine what he wishes accomplished and properly provide for the desired results.



LEATHER COVERED BOOK WITH LIBRARY SEAL BRANDED ON THE COVER

To date, thousands of the Vulcan No. 100 tools have been put into service by telephone companies. The No. 100 has been selected because it is more nearly adapted to the general telephone work and also because it is the first size which was manufactured. There now are being made six sizes.

There is one chance for poor soldering which can be guarded against. There is the possibility that the workman may move the tool too quickly from the parts to be heated. This may be overcome by furnishing the tools at such high temperatures that the operation will be practically instantaneous. It is plain that with almost every kind of light work done in telephone manufacturing plants, the adaptation of the tool should be such that the workman can get up to the highest speed without exceeding the possibility of perfect soldering. In the adoption of properly selected sizes and temperatures lies the remedy for "bad joints."

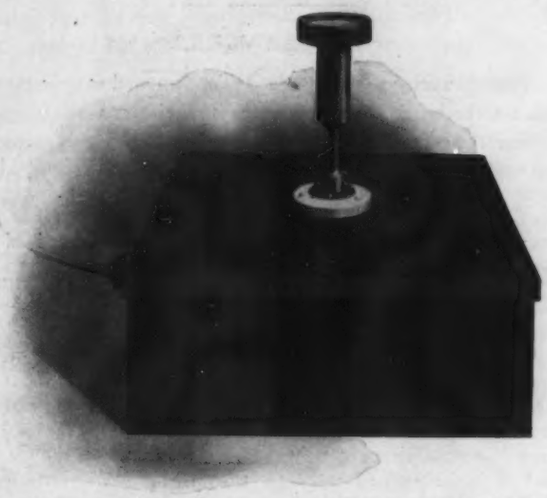
ILLUSTRATING CONSTRUCTION OF "VULCAN" HANDLES, AND SIMPLICITY OF CONNECTIONS TO CABLE

A co-operative study of the varieties of telephone sol-

dering and of the selection of the proper tools for each class of work will result in pratically eliminating bad soldered joints, at the same time radically increasing the speed of the work and generally resulting in important economies as well as improvements in service.

"The Chicago Capper," an invention of Mr. F. G. Dickerson, of the Chicago Solder Company, has supplied a want in machine soldering and branding. "The Capper" automatically solders the tops on to cans. Twelve soldering heads are equipped with special Vulcan electric soldering tools. This machine is for the use of canning factories, solders twelve cans simultaneously and has a capacity of about 6000 cans per hour. It is estimated that this machine will be the means of greatly reducing insurance rates. Heretofore machines used in canneries for soldering the caps on the cans have been heated by gas. The "Capper" is designed to use gas or electricity interchangeably. Electric heat being more easily controlled than gas or gasoline heat, the "steels," as the soldering tools are called, can be regulated accurately.

Electrically self-heated tools are used extensively and are superior to all other appliances in all kinds of soldering operations, in can-making, in metal working, in electrical manufacturing plants, etc. The Western Electric Company,



STAND SHOWN IN PREVIOUS ILLUSTRATION, BUT WITH GUIDES REMOVED, AND BRANDING TOOL TIP EXCHANGED FOR SOLDER MELTING POT

Chicago, is using about 800 of these tools. Electrical repair shops have important uses for these tools, as also do glass leaders. In the manufacture of the fine art glass shades, produced by the Suess Ornamental Glass Company, 193 Wabash Avenue, Chicago, these tools serve to increase the excellence of this delicate work. As concerns telephone work, the Chicago Telephone Company uses several hundred Vulcan tools. Other users, covering a variety of soldering works, are Robert Conklin & Company, 47 Michigan Street. Chicago, makers of tin lanterns; the Lyon & Healy Organ Works, Battle Creek, Mich., makers of pipe organs; the Kinnear Pressed Radiator Company, makers of sheet-metal steam radiators; the Lane & DeGroot Company, makers of sheet-metal lifeboats and manufacturers of roofing, cornices, window casings, refrigerators, etc.

These tools are becoming widely adopted for all kinds of branding, inasmuch as they may be fitted easily with the necessary special tips. They are now used in branding meats, such as ham, bacon, etc., in packing houses. Stationary branding plates of every size and reasonable design can be furnished and any number of them can be used on the same tool separately by interchanging. This arrangement provides by far the cleanest and most sanitary branding device extant, such as meets with the governing stipulations of the United States Government, inasmuch as nothing but heat is given off from the tool to the meat.

Electrically self-heated branding tools are useful in branding tool handles, the American Fork & Hoe Company now using this method, as well as certain telephone and construction companies who brand their implements. The branding of library books is accomplished excellently. The field extends likewise to the branding of furniture, leather goods, shipping boxes, casks, bottle corks, barrel bungs, and in branding bread to do away with objectionable stickers.

A special tool, known as the "felt burner," for printers is the only satisfactory means of taking down the bolsters which form at the felt blankets on large cylinder printing presses.

Electrically self-heated tools have improved the work of leather and rubber shoe forming, in wood and leather embossing, in the melting of pots of solder and of wax. Wherever soldering of any nature is done, the electrically self-heated soldering tools are found to surpass, as in automobile factories, machine and tin shops, dairies, various manufacturing industries of the country, in roofing, in the construction of all classes of marine craft, in the making of ornamental metal work, ceilings, glass skylights, and other heavy glass constructions, in central stations, in electrical manufacturing concerns, in garages, in general repair

"VULCAN" WORK-BENCH HEATING REST FOR SOLDERING COPPERS. NO CABLE CONNECTION TO TOOL USED WITH THIS STAND. NOTE CONTACT SPRINGS IN UPPER PART OF STAND CORRESPONDING TO CONTACT EXTENSION ON HANDLE OF TOOL

shops, in the installation of many sanitary and plumbing, as well as heating, devices, in the production of mechanical novelties and toys, in railroad shops, and in branding ties with special branding tips, and so on throughout the industrial world, to thousands of uses too numerous to attempt to list, much less classify, the electrically self-heated tools are being marketed to a wonderful field and meeting with an extended and increasing demand.

It is beyond question that, as a matter of progress, the next decade will show electrically-heated utensils in the large majority, excluding all others wherever electrical systems prevail. In the future it is inevitable that those who spend large sums of money now on gas or gasoline equipments eventually will duplicate the expense in re-equipping with electrical outfits.

Taking, for example, the electrically self-heated tools marketed by the Vulcan Electric Heating Company, Chicago, the distinctive features are as follows:

1. The entire sheath is brazed together, making one piece of great strength and rigidity, combined with extreme lightness.

2. The brazing of all seams and joints of the sheath also serves to completely seal the heating element against the entrance of destructive fumes, etc.

3. The renewable feature of the copper tips is of great convenience in a variety of work and permits a great saving in the life of the tools. They never stick so that they can not be removed and they are shaped so that they wedge into contact with the heating unit in such a manner so as to insure perfect heat conduction.

4. These tips are of pure copper, forged and hammered, this process being known to produce by far the best results.

5. The one-piece handle is unscrewable easily and slipped back on the electric attachment cable, exposing the conveniently arranged terminals.

6. The connecting screws are amply long and screw into brass contact blocks, ⅛-in. thick, making the stripping of the screw threads impossible.

7. Rapidity of acquiring full heat is marked in Vulcan tools. Only three or four minutes are required to heat a soldering tool.

8. They may be plunged into water for cooling quickly without injury to the tool.

9. They may be used in any kind of weather or unusual atmospheric conditions.

10. The standard voltages are 100, 104, 110, 115, 120, 200, 210, 220, and 230. Special voltages are furnished as required, all windings being equally efficient on direct or alternating current.

11. At the voltage stamped on its handle each tool provides the medium heat considered best for average work. If it is desired to force the work at a higher temperature, tools rated lower than the actual voltage may be used, in this way assuring greater speed at the expense of somewhat increased current consumption.

12. There is no lack of heat in these electrical tools. The only limit is for keeping the copper tip tinned. The tips may be operated at **red heat.**

13. The current consumption is so low that the cost of operation compares favorably with gas, and these tools have already been installed by many at a considerable saving in the cost of the soldering operations.

14. Vulcan tools may be used on full current supply without fear of burning out, even if kept heated when not in use, needing no cumbersome or expensive automatic switches for cutting down the current. The quick-heating feature assures the best economy by complete disconnection when occasionally not in use.

Cost.

The following table, giving energy in watts for each size soldering tool conveys an idea of the cost of operation of Vulcan tools:

Vulcan Copper No. 600 equal to ordinary 1	lb. tool,	55 watts.
Vulcan Copper No. 100 equal to ordinary 1.½	lb. tool,	70 watts.
Vulcan Copper No. 500 equal to ordinary 2	lb. tool,	120 watts.
Vulcan Copper No. 200 equal to ordinary 3	lb. tool,	150 watts.
Vulcan Copper No. 200 equal to ordinary 4.½	lb. tool,	250 watts.
Vulcan Copper No. 400 equal to ordinary 6	lb. tool,	350 watts.

REPEAT ORDER FOR AN ALLIS-CHALMERS TURBINE-ALTERNATOR.

Following the tests recently made on the 1000 kilowatt Allis-Chalmers turbo-alternator now in operation for some months past at the power house of the Kokomo, Marion & Western Traction Company, Kokomo, Ind., this company placed an order with the Allis-Chalmers Company for a duplicate of the turbine unit installed, comprising a 1000 kilowatt turbine, driving a 1000 kilowatt alternator, with turbo jet condensing system complete. The unit is wound for 50 cycles, 2 phase, 2300 volts.

This unit, like the one already in service, will operate normally with steam pressure of 140 pounds per square inch gauge pressure at the turbine throttle, dry saturated, and a vacuum of 28" of mercury, referred to a 30" barometer at the exhaust nozzle. The unit is calculated to carry an overload of 50 per cent when operating under the above steam conditions and at 100 per cent power factor.

In the test of the first unit referred to above, the entire load placed upon the machine aggregated only a little over half its normal capacity or approximately 554 kilowatts on the average. Not only did the machines meet the guaranteed consumption and other conditions of the test satisfactorily, but lowered the steam consumption guarantee at one-half load by 2.1 pounds.

The test was conducted by Mr. Paul Diserons of Purdue University, working in consultation with Mr. Phil H. Palmer, Superintendent, who represented the traction company's interest, and by Mr. F. C. Purcell of Allis-Chalmers Company, Milwaukee.

The second unit just ordered will be placed beside the first one in the power house at Kokomo and will furnish power for lighting and railway service.

The Bossert Electric Construction Co., of Utica, N. Y., has disposed of the switchboard and panelboard department of its business to The Nyelec Switchboard Company, Twenty-eighth Street and First Avenue, New York City, who has the sole right to manufacture Bossert type switches and panelboards. The former superintendent of this department will be in charge of the new factory, and it will be represented by the R. B. Corey Co., 39-41 Cortlandt St., New York City, as sales agents.

WATERWORKS.

San Francisco.—Bids are to be opened on September 18th on the work of cleaning the fire cisterns at the corner of Powell and Ellis Streets, Dupont and Bush, Kearny and Sacramento, Kearny and Post, Montgomery and Bush, Davis and California and Montgomery and Washington by the Board of Public Works. The sum of $10,000 has been voted for their repair, but the contractors cannot bid on this work until the cleaning exposes the wall defects.

Several months ago negotiations were under way between the two companies for the sale of the Pacific holdings to the Gould interests. John A. Britton, manager in San Francisco for Martin and De Sabla, admitted that the matter was being considered, but refused to say how far the negotiations had progressed. Since then little has been heard of the affair until now. It is assumed that the treasury stock will be turned over to the Great Western Power Company. This concern plans a vast electric power system, which will not only be used, it is understood, to operate the Western Pacific trains in the mountains, if not elsewhere, but also to furnish light and power for all purposes in the country lying between Oroville and San Francisco.

Ukiah.—Sealed proposals will be received by the board of managers of the Mendocino State Hospital at Ukiah, up to Sept. 14th, for performing the labor and furnishing the materials for the erection of a steel water tower and tank for the hospital. Plans can be seen at the office of the State Engineer, Nathaniel Ellery, Sacramento; at the office of N. Clark & Sons, 17 Spear Street, San Francisco, and at the office of the steward of the hospital at Ukiah. The height of the tower will be 129 feet; the steel tank at top of the tower will hold 100,000 gallons; the tank will weigh 20 tons and the water 42 tons; the base of the tower will rest on concrete piers embedded several feet in the ground. The Board will leave the erection of the foundation in charge of Steward Handy. The iron work will be let by contract.

Stockton.—According to information from Oroville much interest is felt there in the financial transaction recently put through by the Pacific Gas & Electric Company (the Martin-De Sabla concern), in view of the fact that it is generally believed by bankers and others that the deal was preliminary to turning over the vast property to the Great Western Power Company, which is backed by George Gould and the Western Pacific.

NEWS NOTES

TRANSPORTATION.

San Diego.—The San Diego Railway Company has been granted an extension of time until April 1, 1908, to complete the First and State Street Lines. The difficulty of getting material was given as the reason.

Grass Valley.—The actual work of grading on the narrow gauge cut-off at Chicago Park has commenced, with the contractors, Horna Bros., in charge. They have established a large camp midway on the line of the cut-off, and will keep the work progressing rapidly.

Los Angeles.—The Council adopted a resolution to call for bids for the two street railway franchises covering Hill Street and 16th Street on which the L. A. Pacific has been prevented from laying a third rail. The Council has ordered that a bond of $25,000 be given for each franchise.

Alameda.—The application of the Southern Pacific for franchises to convert its local steam lines into electric roads was read at the last meeting of the council. The petition was referred to the committee of the whole, when the city attorney will be present to discuss the question.

Los Angeles.—There were two bidders for the franchise on Highland Ave., from the North to the South city boundary. M. A. King, of the proposed Pasadena and San Fernando Valley road was one of the bidders, but the Los Angeles Pacific raised the bid to $1000 and was awarded the franchise.

Santa Cruz.—Ground has been broken for the new standard gauge line of the Union Traction Company to Soquel, four miles from here. The line will extend another mile to Capitola to connect with the present terminal, forming a loop. To accomplish this undertaking a large concrete bridge will be constructed over the San Lorenzo River at Water Street.

Oakland.—The South Pacific Coast Railroad has filed an application for permission to change the motive power of its line on Webster Street to electricity. This is the first definite step that has been openly taken in Oakland by the road for the electrifying of its line. The road is under lease by the Southern Pacific. The franchise of the company under which it now operates was granted March 6, 1880, for 50 years.

Reno, Nev.—The cars for the Nevada Interurban Railroad, which is now nearly finished between this city and Moana Springs, have arrived and will be in operation in another week. The electric car line of the Reno Traction Company from Second Street in the heart of the city to University Hill on Tenth Street, has been finished and the first car run on the new line. There is now a complete car line from Sparks through Reno to Moana Springs, a distance of nearly six miles.

Napa.—The proposed bill of exceptions on appeal of the defendants in the celebrated and bitterly fought condemnation of the Beaulier vineyard and others vs. the San Francisco, Vallejo & Napa Valley Electric Road, which was to have been settled by Judge Gesford some time ago, has been postponed until September to be re-set. The defendants, it is learned, are desirous of compromising, and it is more than likely that the appeal will not be perfected. C. W. Greene of San Francisco is attorney for the defendants.

San Francisco.—Mayor Taylor has signed the resolution passed by the Board of Supervisors granting a permit for the resumption of service on the Geary Street road on condition that 10 per cent of the gross receipts be paid to the city. Horace Platt, president of the Geary Street Railway Company, interviewed the Mayor and informed him that the conditions of the resolution had been accepted by the company. Supervisor D'Ancona, Chairman of the Public Utilities Committee, held a conference with Platt, and the question of the return to work of the old employees of the company was discussed. While the company was desirous of having its old employees, Platt did not say on what terms they would be taken back again, saying that would be a matter for future adjustment. In all likelihood the men would be employed if they would accept the wages in force before the strike, which were fixed by arbitration.

Santa Cruz.—At the last meeting of the City Council, City Attorney Osborn appeared with objections to the granting of the franchise to the Ocean Shore road for the rights to a loop route through the city of Santa Cruz. There were 20 objections in all, chief of which were, that the application was not made in proper form; that the description of the route and double track was too indefinite; that it gives the railroad the right to abandon the route described and take other routes along the streets described; that it provides the right to install and operate tracks, such as connecting tracks and switches; that under the provisions a double track, commercial steam railroad may be operated over the streets; that it grants the right to set poles in the middle of the street or on the side; that no limitation is made for the time in which steam power for construction purposes shall be used; that no provision for the limit of speed is made; that no sum is named in payment for the use of the streets and no provision is made for bonds, etc.

ILLUMINATION.

Anaheim, Cal.—Ordinance 200 has been adopted by the City Council, granting to C. A. Watson and R. J. Dunn a gas franchise.

Tombstone, Ariz.—The Tombstone Light & Power Company will move its plant to a more central location. New machinery will be installed.

Santa Rosa, Cal.—The Pacific Gas & Electric Company has awarded a contract to the Globe Construction Company to erect a sub-station building on the south line of First Street, 263 feet west of the west line of C Street. The amount of the contract is $2175.

POWER AND LIGHT.

Spokane Traction Company.—Clyde M. Graves, general manager, says that when the work of double-tracking on North Washington Street is completed a 15-minute service will be put into operation between the northern city limits and Union Park, making it the longest line in Spokane.

Spokane and Inland Empire System.—Postal service has been installed on the Spokane-Coeur d'Alene branch, 34 miles, making two trips a day. This is the only railway postal service on an interurban electric railway in the Pacific Northwest, and it is probably the first to be established in the country carrying United States mail matter distributed on the car for points beyond the termini of the line. The mail car is fitted in the same manner as the postal cars on the transcontinental lines, with sack racks and pigeon holes for distribution of the mail. Mail matter is received and discharged at stations along the line where the car stops.

Mr. Spaulding announces that the plant will cost $2,000,000. The dam will be 100 feet high and 489 feet wide, 130 feet at the bottom and 30 feet at the apex. The power house will occupy the middle of the dam and over the channel of the river. Its size is 66 by 184 feet, with walls 38 feet high and 18 inches thick, the cost being placed at $400,000. There will be seven 10-foot steel conduits leading through the dam-wall to seven pairs of turbines, each weighing 90 tons. The dam will raise the river for a distance of 14 miles, creating a reservoir and giving an area of 12,000,000 cubic feet of water above the dam. R. C. Lowry of Seattle is engineer for the company, and J. E. Ross of Seattle is electrical engineer.

Washington Water Power Company.—W. A. White of New York, who is heavily interested in this company, announces that a power-transmission line, 90 miles, will be built into the Big Bend country, west of Spokane. The power is to be used for lighting towns and operating manufacturing plants and mills at Davenport, Ritzville, Reardan, Harrington, Sprague and Paha. He said his company has no plans for additional city or suburban lines, adding: "As the city grows we shall put in heavier rails and increase our equipment. Regarding the work we have under way, we have been handicapped by reason of the scarcity of labor. We expect to have our new power-transmission line completed from Post Falls to the Coeur d'Alene mining district within two months. This will greatly facilitate the transmission of power to the lead mines, and it will give us a double line. The capacity will also be doubled. If necessary, our new steam auxiliary plant could be placed in commission at once. The plant is capable of developing 3000 horsepower. Next year we expect to add at least 2000 more horsepower to the plant."

Big Bend Water Power Co.—E. P. Spaulding, vice-president and general manager of the concern and president of the Idaho electric railroad, which purposes building a line from Kingston to Murray, Idaho, thirty-three miles, and J. S. McKenna, consulting engineer, appeared before the City Council of Spokane, September 3, and submitted a petition for a 50-year franchise to lay conduits and string light and power wires for commercial purposes in Spokane. The measure provides that the company shall build a power plant twenty-eight miles down the Spokane River and have it in operation in three years. It is estimated that 20,000 net horsepower can be developed. It is proposed to operate 132 miles of electric railroad and light the city of Spokane, also furnish power to manufacturing plants. The company offers to deposit $10,000 as a guarantee, and pay the city $3000 a year until the net earnings shall give an amount equal to five per cent, which will then be paid on the earnings. B. F. O'Neill, a banker at Wallace, Idaho, is president of the two companies.

FINANCIAL.

Point Richmond, Cal.—The town trustees have increased the Richmond Water Company's assessment from $60,000 to $75,000.

San Francisco.—The Board of Supervisors has adopted unanimously the recommendation of the Utilities Committee, denying the petition of Daniel O'Connell and others for the revocation of the street railway and telephone franchises, and that bonds in the sum of $22,000,000 be issued for the acquisition of the systems.

Santa Cruz.—A chattel mortgage given the Merced Trust Company by the Big Creek Light and Power Company May 1, 1907, for $339,000 has been recorded. The mortgagor is a corporation which supplies Santa Cruz and its environs with electricity. It was promoted about ten years ago by Fred W. Swanton and its backers are prominent business men and capitalists of Santa Cruz.

San Francisco.—City Engineer Woodward has submitted to the Board of Supervisors an amended ordinance declaring that public interest demands the issuance of bonds for the acquisition of an auxiliary high-pressure water system for fire protection. The new ordinance designates a larger area in the protected district, which is to be provided with pumping stations, storage reservoirs, distributing mains, hydrants and a system of cisterns.

Alameda, Cal.—The City Council has set Saturday, Sept. 21st, as the date for the bond election for proposed public improvements. The projected bond issue is divided as follows: For parks and playgrounds, $125,000; electric light and power plant improvements, $50,000; new school building and site, $50,000; additional fire apparatus and house, $25,000; improving Webster Street roadway, $37,000; improving Bay Farm Island road, $13,000; improving library building, $5000.

INCORPORATIONS.

Los Angeles.—The Premier Oil Company has been incorporated with a capital stock of $1,000,000 by W. M. Wallace, C. J. Berry, J. D. Thomson, T. and P. E. Spellacy.

Los Angeles.—With H. E. Huntington at its head, the San Gabriel Valley Water Company, capitalized at $2,500,000, has been incorporated. Its aim is to develop a large supply for the great valley after which it is named, and especially for the domestic uses of many towns and tracts in which the trolley magnate is principal owner, including Los Robles, El Molino, San Marino Park, Lake Vineyard and Alhambra. Particular provision is made that water shall be supplied to the quaint little Church of Our Saviour, near San Gabriel, in which certain stockholders are interested. Other directors, all Pacific Electric men, are George S. Patton, Albert Crutcher, G. C. Ward and E. T. Cook.

OIL.

Richmond.—The Standard Oil Company has let a contract for the erection of five additional large stills, which will make 55 stills at Richmond. They are to be built of brick, and their completion will mean the employment of 50 more men.

Visalia, Cal.—The register and receiver of the Land Office have received a notification from the Secretary of the Interior withdrawing from agricultural entry about twenty-five townships in the western end of Fresno County, covering practically the entire Coalinga oil fields. A large part of this land was withdrawn from entry several years ago and again released within the last few months. This second withdrawal is to hold good pending examination by the Geological Survey to determine whether it is mineral in character.

Sacramento.—The plans have been prepared and bids are now being advertised for the installation of steel oil tanks and a smoke-stack at the Agnews Asylum. The plans were prepared by draughtsmen in the State Engineering Department, who have also prepared the plans for a water tank of 100,000 gallons capacity at the Mendocino State Hospital. This tank will rest upon a steel frame-work 101 feet above the ground, and the tank will be 28 feet in height. Everything connected with the tank and tower will be composed of steel and it will rest upon a concrete foundation.

Bakersfield.—An agreement has been filed between the Sunset Oil Company and the Operators' Oil Company, and the San Pedro, Los Angeles & Salt Lake Railroad Company, by the terms of which the railroad company secures from the oil companies all the oil required by it for fuel purposes for the next five years. The price to be paid is graduated—30 cents for the first year, 35 cents for the second, 40 cents for the third, and 45 cents for the last two years. Large development of from ten to fifteen new wells to meet the demand of the railroad company, which it is said will amount to 15,000,000 or 20,000,000 barrels in the first five years, is to commence immediately.

Bakersfield.—John P. English, who is building the Standard Oil Company's pumping station at Midway, says that he hopes to finish the Midway station in about a week. The contractor will next move to Rio Bravo, where an intermediate station will be built, and when that is completed, he will commence on a similar building at McKittrick. The Midway station will hold five boilers and will be first class. The pipe line between Midway and Oil Center has been tested with water pumped from the Kern River end. The pressure was carried up to 700 pounds to the square inch. The pipe is all strung and partly coupled between Midway and McKittrick, and good progress has been made in setting up the big steel storage tanks. One of the completed tanks is nearly full of oil, ready to be started through the new line as soon as the pumping station is completed.

Stockton, Cal.—Stockton capitalists, headed by J. Jerome Smith and Joseph Lynch, have closed a deal for the construction of a large oil refinery and asphaltum plant, to be located in Stockton and to cost $30,000. They have been working on the project several weeks and have made complete arrangements for a supply of oil to operate the plant by leasing twenty acres of fine land in the Sunset district, near Bakersfield, for fifteen years. One well is almost completed and seven others will be sunk as fast as possible. As this land has been proved a large oil producer, the men who have the matter in hand say that they will secure all of the fuel required. Other wells in this vicinity give up from 200 to 300 barrels daily. The product will be shipped to Stockton and refined. Asphaltum will be the principal product, owing to the fact that the oil from this particular locality is of thirteen per cent gravity, or, in other words, carries an unusually large per cent of asphaltum ingredients.

TELEPHONE AND TELEGRAPH.

Red Bluff, Cal.—Responsible parties are requested by N. E. Buyot, manager, to submit bids for the construction of forty-two miles of telephone line from Red Bluff to the property of the California & Massachusetts Copper Mines Company.

Los Angeles.—Alleging that H. C. Chase, superintendent of telegraph for the Santa Fe Railroad, has assisted the Western Union Telegraph Company by transferring his force of day operators to the Western Union office for night duty, the organization of striking operators adopted and forwarded an appeal to E. P. Ripley, president of the Santa Fe, asking him that the practice be prohibited. In support of their petition the strikers' communication affirms that the railway telegraphers so employed are overworked and are liable to make fatal errors in the regular places of employment.

San Francisco.—At the last meeting of the Public Utilities Committee of the Board of Supervisors a resolution was laid upon the table, providing that a commission of engineers be appointed to investigate the virtues and cost of an underground conduit for electric wires, and to prepare a practical plan, under which a limited portion of the overhead wires might be placed underground each year, so that all overhead lines might be buried within ten years. Another resolution, ordering the telephone companies to refrain from erecting any more poles until the validity of their permits has been looked into, was also laid over until the next meeting.

San Francisco.—Local army people state that early in next year it will be possible to communicate by government wireless telegraph stations from San Francisco and Seattle to Nome and St. Michaels, Alaska. Arrangements have been made whereby the war and navy departments will co-operate in transmitting messages between these places. The navy already has stations at North Head, Sable Bluff and Cape Blanco, between San Francisco and Seattle, and at Tatoosh Island and Sitka, Alaska, 1000 miles from Tatoosh. A navy wireless station will be established at Valdez, Alaska, about 850 miles from Sitka. Next year the signal corps of the army will establish a wireless station at Fort Gibbon, which will complete the chain between Valdez and the army stations now working at Nome and St. Michael. Work toward putting into operation wireless communication between Fairbanks and Circle City, Alaska, over a distance of about 140 miles, is progressing satisfactorily under supervision of the signal corps of the army. A steel-frame tower, 175 feet high, is to be erected at each place to carry the sending and receiving instruments. All material for each station has been sent to Alaska and is now on the ground, with the exception of the generators. These have been shipped, and if they can be forwarded from Seattle before close of navigation the stations will be working this fall. The cost of installation, maintenance and operation of the wireless stations will be much less than that of land lines between the two points. It is expected that the signal corps will have a land line completed between Gakoma and McCarty, Alaska, by September 1st. The telegraph line from McCarty to North Fork will then be abandoned.

TELEPHONES.

Helena, Mont.—At a meeting of the Retail Merchants' Exchange of Helena last week, a resolution was adopted to the effect that telephones would not be removed in compliance with the suggestions of strike sympathizers so long as the company continued to give service.

Vancouver, B. C.—The B. C. Telephone Co. has applied to the city for permission to place underground conduits for the laying of its cables on Powell Street and Columbia Avenue. This action is taken in accordance with the agreement of the company, made two years ago, whereby it bound itself to place all its wires in the business district underground within a specified time.

Dillon, Mont.—H. J. Bagley, of Baker, Idaho, was in Salmon Saturday, having just returned from the closing work of completing the Lemhi Telephone Co.'s line into Dubois, on the Short Line Railway. By this time, the connection has been made with the Bell long-distance system, so that people of this county can talk to outside points direct, connecting up with Salt Lake City, Boise, and other places.

Bellingham.—The Home Telephone Co. requested permission to move its wooden building at the corner of Railroad Avenue and Chestnut Street across Railroad Avenue and up Chestnut Street to Forest Street. The request was laid on the table, and Street Commissioner Hopkins was instructed to notify the company that the structure, if removed, must not interfere with the operation of street and steam railroads. Manager Middleton is asked to appear before the Board.

POWER AND LIGHT.

Bay City, Ore.—An electric light plant will soon be installed in this city.

Everson, Wash.—C. T. Dean has asked the County Commissioners for a franchise for laying gas mains and water pipes in this city.

Redwood City, Cal.—At a recent meeting of the supervisors the bid of W. J. Martin of $100 for a franchise to install and maintain an electric light and power plant at South San Francisco, to furnish light and power to residents of the First township, was the only bid received. The matter of awarding him the contract was laid over a week.

Billings, Mont.—The Billings Mutual Heating Company has been organized to construct a hot-water heating plant in this city. P. Williams, of Chicago, is the man behind the move. He has associated with him P. B. Moss, R. D. Stocking and F. H. Beeman, of this city. The company will commence at once the construction of a power plant, and will run hot-water mains through the main streets of the city.

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